

**Pneumonia Case Management in Children Under-Five: A  
Study in First Referral Hospitals in Khartoum, Sudan**

**Renas Fadlallah Al Mubarak**

**Supervisor:**  
**Professor Gunnar A. Bjune**

**Co-supervisor:**  
**Professor Zein A. Karrar**

**University of Oslo  
Faculty of Medicine  
Department of General Practice and Community Medicine  
Section for International Health  
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# Abstract

## **Pneumonia case management in children under-five: a study in first-referral hospitals in Khartoum, Sudan**

Al Mubarak RF<sup>‡</sup>, Bjune GA<sup>‡</sup>, Karrar ZA<sup>§</sup>

<sup>‡</sup> Department of General Practice and Community Medicine, University of Oslo, Oslo, Norway

<sup>§</sup> Department of Paediatrics, Faculty of Medicine, University of Khartoum, Sudan

**Background:** Pneumonia is a major cause of under-five morbidity and mortality in Sudan. Pneumonia standard case management has been followed in Sudan through the National ARI Programme. No studies have thus far looked at the inpatient case management of children admitted with pneumonia.

**Objectives:** The study aims to describe the health care that children under five receive before reaching a first referral hospital, and the case management they receive when admitted as inpatients.

**Methods:** In a cross-sectional descriptive study, children between 2 months and five years who were admitted in any of 3 referral hospitals from September to December 2005 in Jebel Awlia locality in Khartoum were enrolled. Interviews using structured questionnaires were used with caretakers to determine care seeking patterns prior to hospitalization. Patient records were used to determine case management; hospital registers, equipment and staffing levels were checked.

**Results:** A total of 224 children were enrolled in the study. One of the 3 hospitals was the provider at which 61% of the caretakers sought care at first. Thirty percent of the caretakers bypassed a health centre or another hospital within 5km of their homes; in a third of those, unavailability of services at facilities bypassed was the reason for this bypass. Of the children reaching the hospitals after being referred from other facilities, 53% were given a pre-referral treatment. At the hospitals, pneumonia constituted 38% of children under five admitted. Incomplete assessments of children's signs, particularly danger signs, lead to 90% of the children to have an inadequate classification and to a discrepancy between classification and treatment. Monitoring of the children's progress was inadequate.

**Conclusion:** The findings suggest that areas to improve case management at hospitals include training health workers on assessment, classification, inpatient treatment and monitoring; in addition to complete recording of findings.

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## Dedication

*To my family*

*To the children*

## List of Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ANA	Acute Respiratory Infections Needing Assessment
ARI	Acute respiratory infections
CDD	Control of Diarrhoeal Diseases
CLHP	Child Lung Health Programme
EPI	Extended Programme of Immunization
EPI-LAB	Epidemiological Laboratory
ETAT	Emergency Triage and Treatment
FMoH	Federal Ministry of Health
GDP	Gross Domestic Product
IDPs	Internally Displaced Persons
KAP	Knowledge, attitude and practice
UNION	International Union against Tuberculosis and Lung Disease
MCH	Maternal and Child Health
MICS	Multiple Indicator Cluster Survey
NCHS	National Centre for Health Statistics
NGO	Non-governmental Organization
NTP	National Tuberculosis Programme
OPD	Out-patient Department
PHC	Primary Health Care
SCM	Standard Case Management
SDD	Sudanese Dinars
SMoH	State Ministry of Health
SMS	Safe Motherhood Survey
UNICEF	The United Nations Children's Funds
WHO	World Health Organization

# 1. Introduction

Acute respiratory infections (ARI), predominantly pneumonia, are one of the leading causes of death amongst young children in developing countries<sup>(1-3)</sup>. The World Health Organization (WHO) estimated that ARI accounted for 18% of death among children under five years of age globally<sup>(4)</sup>. In Sudan, ARI is the third cause of outpatient department (OPD) consultation in children under five<sup>(5)</sup> and pneumonia remains the leading cause for under five hospital admission and mortality<sup>(6)</sup>. From this stemmed the importance of promoting child lung health through the Child Lung Health Programme (CLHP). The ARI programme, under the Federal Ministry of Health (FMoH), has entered into a co-operation with the International Union of Tuberculosis and Lung Disease (UNION) and Epidemiological Laboratory (Epi-Lab) to implement the CLHP. The Epi-Lab is a national centre developed from the experiences of the Sudanese National Tuberculosis Programme (NTP). The aims of the CLHP are to implement the UNION programme for the surveillance, diagnosis and treatment of respiratory diseases in children, based on the successful model for tuberculosis control, and by applying the WHO standard case management (SCM) strategy. The CLHP is still in the situation analysis phase.

In Sudan, little is known about the case management of pneumonia in first referral hospital settings, and the extent to which standardised guidelines are being followed in inpatient management. In this study we are trying to put forth baseline data on SCM which the CLHP can use in its implementation activities, and against which it can monitor and evaluate its progress once it has started. In doing so, we are aiming to identify measures that should be taken at a first referral hospital to improve delivery of SCM. Moreover, we are describing the health seeking patterns and different care providers for children under five with pneumonia before reaching the hospital, enabling the development of community-targeted health education messages that could be complementary to the programme.



## **1.1 Background**

### **1.1.1 Country Profile**

Sudan is the largest country in Africa with an area of 2.5 million square kilometers. It has borders with the Red Sea and nine other African countries, where the Sudanese population and those of the neighbouring countries move freely across these borders. It is characterized by a strategic geographical location, which links the Arab world to Sub Saharan Africa. Sudan is a multicultural and multi-ethnic society. The country is a federal state, divided administratively into 26 states. The climate is arid in the north and tropical in the south, where the rainy season lasts from April to October.

### **1.1.2 Population and demographic characteristics**

The population of the country is estimated at 32 million (projected from 1993 census). The population is unevenly distributed in the 26 States; the majority is concentrated in 6 States of the Central Region with a mean population density of 10 people per square kilometers, increasing to 50 at the agricultural areas<sup>(7)</sup>. Around 30% of the population lives in urban areas due to migration which includes large numbers of internally displaced persons (IDPs) from southern Sudan. The United Nations estimates that there are 4 million IDPs in Sudan. In many cases, particularly in Khartoum, the distinction between the IDPs and the urban poor has become blurred over the years<sup>(8)</sup>. With an annual growth rate of 2.6% and fertility rate of 5.9 (5.1 in urban and 6.5 in rural areas), young people dominate Sudan's demographic structure: 16% of the population is less than 5 years and 45% less than 15 years<sup>(5)</sup>.

### **1.1.3 Socioeconomic context**

Sudan is rich in terms of natural and human resources, but economic and social development have been below expectations. Life expectancy at birth, a measure of the general health condition and an indicator of the standard of living, was estimated around 54 years, about the average of least developed countries<sup>(7)</sup>. Half of the population over age 15 years is illiterate with a wide range of variation between urban (33%) and rural (61%), without a notable gender gap<sup>(9)</sup>.

In Sudan, well over 50% of the population lives below the poverty line. The overall government health expenditure is very low and the health sector is under-funded. As overall government expenditure has increased largely due to growth in oil revenues, allocation to health sector in absolute terms have also increased. The Gross Domestic Product (GDP) per capita for 2001 was estimated at \$395. Recently, increased government revenues (largely due to oil production) have allowed an increase in public expenditure on the health sector. However, as a proportion of total government spending it has remained relatively constant at very low levels in comparison with other developing countries<sup>(7)</sup>. No data is available concerning the specific expenditure on child health, and the current initiatives and programmes working in child health depend mainly on resource from external donors, mainly UN agencies and international organizations<sup>(10)</sup>.

#### **1.1.4 General Organization of the health system**

The introduction of federalism in Sudan in 1994 fostered a three-layered health system structure. These are Federal, State Ministries of Health (SMoH) and Local health system. The Federal Ministry of Health (FMoH) is responsible for the development of national health policies, strategic plans, monitoring and evaluation of health systems activities. The SMoH are mainly responsible for policy implementation, detailed health programming and project formulation. Sudan has 26 SMoH, one in each State. Within each State there are a number of localities (134 in total) managed through the Health Area System; however less than half of the localities have a functioning Health Area System, and only 19 are reportedly working to the standards<sup>(11)</sup>. Health services are provided through different partners in addition to federal & state ministries of health, including armed forces, universities and the private sector<sup>(7)</sup>.

The delivery of care is organized in three tiers. The first level consists of Primary Health Care (PHC) units (providing essential PHC services), dispensaries (managing more serious cases) and health centres (which include laboratory and X-ray units, but no inpatient wards, and are usually staffed with medical assistants, doctors, vaccinators, laboratory technicians and nutritionists). The PHC units are usually staffed by community health workers and dispensaries are staffed by medical assistants and nurses. The second level (first referral) is represented by rural hospitals,

which are usually staffed by physicians, medical assistants, nurses and other paramedical staff. Specialized and teaching hospitals in the state capitals, offering more developed services, represent the tertiary (second referral) level. Primary level health facilities represent 95% of the total network, while the two higher levels contribute only 5%. The system is not uniform and variations do exist especially in the worse-off states and localities. Urban-rural variations also exist<sup>(5)</sup>.

### **1.1.5 Child mortality and morbidity in Sudan**

The 1999 Safe Motherhood Survey (SMS) data suggest that the infant mortality rate was 68 per 1000 live births with little difference between urban and rural areas. Under-five mortality rate was 104 per 1000 live births in the north (101 urban, 105 rural). These levels are lower than the Sub-Saharan Africa average of 162 but, masks rates that are comparable and sometimes higher than the Sub-Saharan average, namely in South Kordofan, Kassala, Blue Nile and Red Sea<sup>(9)</sup>.

The 2003 health statistical report showed that deaths among children under five were caused by pneumonia (17%), malaria (12%), malnutrition (10%), septicemia (12%), dehydration (9%) and diarrhoea (8%), which is highly correlated with life style, living conditions and the nutritional deprivations experienced by the poor. The top five causes of under-five hospital admission were pneumonia (27.4%), malaria (23.5%), dehydration (9.3%), malnutrition (7.6%) and diarrhea (7.4%) in 2003 <sup>(6)</sup>.

Seventeen percent of under-five children in the north and 14% in the towns of the south had an acute respiratory infection in the two weeks prior to the Multiple Indicator Cluster Survey (MICS) in 2000. In the north, about 15 percent of children under five in urban compared to 17.8% in the rural areas had ARI. Approximately 62% of these children were taken to an appropriate health provider<sup>(9)</sup>.

### **1.1.6 Child health services**

The child health services are routinely provided at the PHC facilities at both rural and urban areas. The services are included within the maternal and child health (MCH) package of services and focused on immunization, nutritional services, education and curative services of the sick child. The distribution of the MCH centers varies widely in different states. Out of a total 2,500 eligible health facilities, only 820 health facilities (33%) provide MCH services with a breakdown of 133 hospitals, 433 health centers and 254 health units. In nine states, MCH services are not provided through

public sector health facilities. Of the total number of health facilities providing MCH services, 395 or 48% are located in Khartoum state. The two extremes are that there is one public sector owned MCH facility for 12,500 population in Khartoum state and 230,570 in West Darfur versus no facility in another nine states. The specialized curative services are provided at tertiary facilities mainly for the seriously sick and complicated cases. The child health service standards at various levels of the health care delivery system are not well addressed. Accessibility and availability, early referral and emergency management especially in the rural areas are chronic problems of the child health services<sup>(11)</sup>.

### **1.1.7 The Child Lung Health Programme**

The FMoH has entered into a co-operation with the UNION and Epi-Lab to implement the CLHP. The aims of the CLHP are to implement the UNION programme for the surveillance, diagnosis and treatment of respiratory diseases in children, based on the successful model for tuberculosis control. At the same time it aims to build up the competence of the programme by strengthening the management and technical capacity at central and district levels of the ministry of Health. The ultimate purpose is to establish national self sufficiency of health services delivery for respiratory diseases in children. The programme's specific objectives are:

1. To standardize case management for severe and very severe pneumonia in the secondary level hospital paediatric inpatient wards.
2. To reduce mortality due to respiratory diseases especially severe/very severe pneumonia in children under 5 years of age.
3. To rationalise the use of drugs for ARI in children under 5 years of age.
4. To provide uninterrupted supplies of essential drugs and oxygen at secondary level hospitals. The programme will be incorporated into the existing structure for organization of health services and will be implemented by the personnel already working within these services.

## **1.2 Literature review**

### **1.2.1 Burden of Acute Respiratory Infections in the Developing World**

ARI is the leading cause of deaths in young children in low income countries; the form of ARI most often leading to death, in this age group, is pneumonia<sup>(1)</sup>. The percentage of children dying from pneumonia in developing countries rises up to 26%. The largest part of these deaths is due to pneumonia either as an underlying cause, or as a result of infections complicating measles, pertussis or AIDS<sup>(12)</sup>.

ARI cause one of the most frequent illnesses in children under five years throughout the world with an average of 4 to 9 episodes per child annually. The high incidence of ARI is reflected in the use of healthcare services: up to 60 percent of all paediatric outpatient visits and 20 to 49% percent of paediatric hospitalizations in low income countries are patients with ARI<sup>(12)</sup>.

### **1.2.2 Standard Case Management**

The WHO established a global ARI programme in the early 1980s to promote the early detection of ARI, especially pneumonia in the community. The specific aims of the programme are the reduction of the incidence and mortality of pneumonia, the reduction of inappropriate use of medications for the treatment of ARI, and the reduction of upper ARI complications. The cornerstone of the programme is the standard case management (SCM). Case management involves:<sup>(1)</sup>

- early recognition of pneumonia by health workers using signs of fast breathing and chest indrawing
- prompt referral to hospital for injectable antibiotic treatment and other intensive care, for severe and very severe cases
- antibiotic treatment at home with recommended drugs, for cases of pneumonia that are not severe
- supportive home care for the vast majority of ARI that do not require antibiotics. Case management intervention studies have shown that the case management strategy has a substantial effect on infant and under five mortality<sup>(13)</sup>.

### **Case management guidelines**

The WHO and the United Nations Children's Fund (UNICEF) combined the successful approaches to ARI and diarrhoeal disease case management, and added to them the clinical management of malaria, measles, meningitis and malnutrition. Integrated Management of Childhood Illness (IMCI) is the name given to this combined approach<sup>(14)</sup>. The IMCI strategy is to improve case management at first level facilities. Case management guidelines at the first-level outpatient facility describe the following basic steps:

- The health worker first *assesses* the child by asking questions, examining the child, and checking the immunization status.
- The health worker then *classifies* the child's illnesses, using a colour-coded triage system; each illness is classified according to whether it requires urgent referral, specific medical treatment and advice, or simple advice on home management.
- Specific *treatments* are then identified; if the child is to be referred urgently, the health worker gives only essential treatment before the child is transferred.
- The *mother is taught* how to treat her child at home, including how to give oral drugs, to increase fluid intake during diarrhoea, and to treat local infections.
- The *mother is advised* on how to recognize the signs which indicate that the child should immediately be brought to the clinic and is given the dates for routine follow up; feeding practices are assessed and the mother is advised on how best to feed her child.
- Finally, any necessary *follow-up instructions* are given when the child returns to the clinic.

### **Case management at the first referral level**

Further reduction in child mortality can be achieved by effective care at the first referral level, such as district or small hospitals in developing countries. Guidelines were developed that focused on the inpatient management of the major causes of childhood mortality, such as pneumonia, diarrhoea, severe malnutrition, malaria, meningitis, measles, and related conditions<sup>(15)</sup>. These address the need for high quality of care of children admitted to referral facilities. There is an emphasis on the sequential process for managing sick children as soon as they arrive in hospital, starting from triage and emergency treatment, to assessment (including history,

examination and appropriate laboratory investigations), treatment, monitoring progress and discharge.

In this context, pneumonia case management means that a child presenting with cough/difficulty breathing is assessed for the presence of danger signs (e.g. convulsions, inability to drink, cyanosis) and clinical signs (e.g. respiratory rate and chest indrawing), classified, treated and monitored accordingly.

### **1.2.3 Quality of care**

Many factors contribute to quality of care. Donabedian defined and assessed quality of care using a framework incorporating structural, process and outcome elements which have several measures<sup>(16)</sup>. Structural components include materials, equipment, personnel and training. Some of the process components are adequacy of diagnosis, treatment and prevention procedures, use of case management guidelines and skills of health workers and supervision. One of the most important and most commonly used outcome measures in clinical settings is patient satisfaction.

There is little published literature on general paediatric quality of care from developing countries. Most of the literature from industrialised countries relates to specific diseases or to admission and discharge experience with very little published on general quality of paediatric care<sup>(17)</sup>. One study that attempted to get an overview of paediatric emergency care in hospitals in developing countries was that conducted by Nolan and his colleagues<sup>(18)</sup>. It covered a broad range of quality issues including emergency triage and treatment (ETAT); in-patient management; knowledge, skills and practices of health workers and support services. This study sought to identify potentially reversible causes of poor quality of care /poor outcomes in 21 hospitals in 7 countries (typically one teaching hospital and 2 district hospitals in each country). Many problems with triage, emergency care, monitoring, drug availability, staffing levels, and the use of protocols were found. In all instances the quality of care delivered by teaching hospitals was found to be higher than that within small hospitals in the same country. Another important area that has received little attention and that was highlighted by the study was the importance of monitoring of the progress of the sick child in hospital.

In Nigeria, shortcomings in equipment, training, supervision and non-use of national case management algorithms, in addition to a range of quality measures, contributed

to inadequacy in the quality of health service delivery at the PHC level <sup>(19)</sup>. Case management was found to be deficient in both Benin and Zambia, where it was found to be inconsistent and not standardised, with incomplete assessment of children's signs and symptoms, incorrect diagnosis and treatment of potentially life threatening illnesses, and failure to refer seriously ill children to hospitals <sup>(20;21)</sup>.

Health worker evaluation studies can be used to identify predictors of health worker performance. The knowledge of these predictors can be used to help in the design of interventions. Quality improvement, however, should not focus too narrowly on individual competence as measured by knowledge and skills, rather than make an overall status assessment of health practices within the health system <sup>(17)</sup>.

#### **1.2.4 Care seeking**

The decision to take a sick child to a health facility is part of a complex care-seeking process that can involve many people. It has three interlinked components which differ in importance depending on the setting. Caregivers:

- initially *recognize* that the child is ill
- *label* the illness, both within the local classification system and by severity, based on the recognized symptoms and illness context
- *resort to care*, influenced by the label, along with barriers such as time and money constraints.

The process is not linear; for example within an illness episode the label may change as community members offer advice, new symptoms are recognized and treatments fail <sup>(22)</sup>.

Appropriate care-seeking means that the need to take the child for treatment outside the home is recognized, that the care is not delayed, and that the child is taken to an appropriate health facility or provider <sup>(22)</sup>. Throughout the literature, care seeking for childhood illnesses has been associated with many factors including child, caregiver, facility and illness characteristics. Child characteristics are the age and sex of the child. Caregiver characteristics include age, education, occupation and income of the caregiver. Facility's costs, physical and social distance, and quality of care are implicated as important factors. Finally, the illness characteristics; in the form of type, severity and local beliefs/perceptions; play a major role in care seeking patterns. All



these factors differ in importance depending on the different settings, but definitely all have an important impact on the care seeking process.

The prevalence of caregiver recognition of severe illness varies. In an urban community in Addis Ababa, most mothers didn't recognize rapid breathing and chest indrawing<sup>(23)</sup>, while in a rural setting in northeast Ethiopia mothers recognized pneumonia by grunting, fast breathing, decreased feeding and fever<sup>(24)</sup>. In other settings recognition appeared to be good, with 65% of mothers in Egypt correctly identifying children with ARI as having fast, abnormal or rapid breathing<sup>(25)</sup>. Ethnographic studies also report variations in recognition. A study in Ghana found that poor recognition of danger signs was a barrier to care seeking<sup>(26)</sup>. In Sri Lanka however, high care seeking of mother caretakers was noted, particularly for illnesses with acute high-risk symptoms and signs<sup>(27)</sup>. In India, there was little recognition of fast breathing<sup>(28)</sup>. In two studies, one in Pakistan and one in Bangladesh, however, ARI symptoms were well recognized<sup>(29;30)</sup>. Recognition is only part of the care-seeking pathway however, and is not always the reason for poor care-seeking. In the rural setting study in Ethiopia, even though the caretakers recognized important respiratory signs, only 36.5% would take their children to a nearby health center<sup>(24)</sup>. Similarly, in Egypt, caretakers didn't use their recognition to take appropriate action<sup>(25)</sup>. On the contrary, in Sri Lanka, recognition was not necessary for care-seeking; caretakers could not recognize danger signs and symptoms but overall care-seeking was high<sup>(27)</sup>.

Illness management practices vary from home remedies; self prescribed drugs and dietary restrictions to immediate care seeking from different providers. Most studies report home treatment in the initial stages<sup>(24;26;29;31;32)</sup>. Providers may be broadly divided into allopathic and alternative health providers. Several studies have shown variations in the use of the two systems of care. In Indonesia<sup>(33)</sup> and Ethiopia<sup>(24)</sup> there was a high prevalence of using the traditional sources of health care, while in other settings private doctors were used more frequently<sup>(25;27;29)</sup>. Possible explanations put forth for such a phenomena is that private doctors are often perceived as being of better quality, having more convenient opening hours, a better supply of drugs and shorter waiting times. In some settings, medical care was promptly sought for most

severely ill children but the choice of providers was inappropriate or the overall quality of care poor <sup>(28;29)</sup>.

Mothers' age and education, age and sex of the child, duration of the illness and socioeconomic status have all been given different weights in the care seeking process and in the utilization of different health services. In Brazil, mothers' education and family income were not found to be positive predictors of the type of care sought, whereas the duration of illness was significantly associated with the first source of care sought <sup>(34)</sup>. In Indonesia, Sutrisna et al. found that the child's age and duration of his/her illness were independent predictors of care seeking behaviour<sup>(33)</sup>.

### **1.2.5 IMCI in Sudan**

IMCI was introduced as a strategy to address the most important causes of under-five mortality and morbidity using an integrated approach in line with the primary health care policy. The early implementation phase of IMCI in Sudan started in December 1997, involving two states (Khartoum and Gezira). Since 2000, the strategy has been expanding and IMCI is now implemented in 15 states: 8 in the expansion phase, 4 in the early implementation phase & 3 states in the introductory phase <sup>(10)</sup>.

The main component adequately addressed through the IMCI is the training of the health care providers at various levels on standard case management through establishing training centers. The other two, namely strengthening of the health care system and improving the quality of the community-based childcare are not well addressed <sup>(11)</sup>.

### **1.2.6 Acute Respiratory Infections in Sudan**

Sudan implemented a national ARI programme from 1987, thus following the SCM guidelines that were established by the WHO. Relatively few studies were done on ARI in Sudan. Through our literature review, two studies looking at risk factors in hospitalised children were identified<sup>(35;36)</sup>. A community based intervention study assessed mothers' and caretakers' knowledge, attitude and practice (KAP) about appropriate care seeking for children with ARI, and evaluated the impact of a health education on their KAP <sup>(37)</sup>. A quasi-experimental study to evaluate the capability of community health workers to correctly manage ARI cases in the Red Sea State suggested that these latter could effectively detect and treat ARI cases <sup>(38)</sup>.

Two main survey instruments for the evaluation of ARI programmes have been developed by the WHO: the health facility survey, which provides information on progress made in training, supervision and logistics to ensure population access to SCM of pneumonia, and the household survey, which is intended to measure the effect of communication activities in increasing families' use of the SCM of pneumonia offered by health facilities <sup>(39)</sup>. Both types of surveys were conducted in Sudan. The ARI health facility survey was conducted in November 1994 in hospitals and health centers in Khartoum and four central states (Gezira, Sennar, Blue Nile and White Nile) <sup>(40)</sup>. Results showed that while 57% of the health facilities were able to give standard case management, only 39% of pneumonia cases managed in the health facilities received SCM. Nevertheless, the findings provided some encouraging evidence: surveyors and health workers agreed on correct ARI classification in 71% of cases observed, and recommended antibiotics were the most commonly used drugs to treat pneumonia.

This was followed in 1995 by a CDD/ARI household survey in three states: Khartoum, Gezira and Kassala <sup>(41)</sup>. This survey revealed a 23% prevalence of ARI Needing Assessment (ANA). The survey found some encouraging findings: caretakers' knowledge about when to seek care for ARI was 80%, and care was sought from an appropriate provider in case of ANA in 79%.

More recently, in 2003, an IMCI health facility survey was conducted in seven states<sup>(42)</sup>. It assessed the quality of outpatient care, including both clinical and counseling care, provided to sick children less than five years of age. Moreover, it described organizational and other health systems support elements influencing the quality of care and tried to identify major constraints to it. It also measured key indicators of quality care to monitor progress of the IMCI strategy at health facilities. The results on case management showed a better performance for tasks carried out by providers trained in IMCI than those untrained; evidence that IMCI training can improve quality of care. The overall level of performance however remained sub-optimal.

## **2. Objectives**

### **2.1 Study question**

What process do children under five with ARI go through until they reach first referral hospitals? To what extent is WHO SCM followed in first referral hospitals?

### **2.2 General objective**

To describe the health care that children under five with pneumonia receive before and after reaching hospitals in Jebel Awlia locality in Khartoum, Sudan.

### **2.3 Specific objectives**

- To identify sources of care for children with pneumonia before reaching a first referral hospital.
- To establish the proportion of children with pneumonia referred by primary health facilities and given appropriate pre-referral management.
- To estimate the magnitude of pneumonia as a caseload first referral hospitals.
- To identify how pneumonia SCM is followed in the in-patient department in comparison to WHO's guidelines.

### 3. Methods

#### 3.1 Study design and setting

The study conducted was a cross sectional, hospital based descriptive study. It was conducted in the urban Jebel Awlia locality in Khartoum state, the capital city of Sudan. Khartoum state has six other localities. Jebel Awlia is located in the southern part of Khartoum state. The total population in the locality was around 1,080,000 by the end of 2005. The under five population in the locality is approximately 16% of the total population, i.e. about 170,000. The locality is further divided into two health area management teams, namely Kalaklat health area team, and Azhari and Nasr health area team, with the respective populations of 590,000 and 490,000. Residents of the locality represent a wide variety of Sudan's tribes and ethnic groups, who have come from all parts of Sudan. There are two official camps for displaced populations in the locality, in Nasr and in Jebel Awlia. These comprise inhabitants from the western and southern parts of Sudan, who have fled these conflict areas. Residents of the camps have good access to health services offered by national and international non-governmental organizations (NGOs). These offer basic PHC services which include immunization, curative care, health education and MCH services. In addition, Bashair hospital serves the camp located in Nasr area, while Jebel Awlia hospital serves that in Kalaklat Area.

Jobs for the population in the locality vary from governmental workers to skilled and unskilled workers. There's a relatively good network of paved roads (except inside the camps) and a good public transportation service that run for 30-50 Sudanese Dinars (SDD) from the centre of the city to the locality (1 \$US = 220 SDD). Inside the camps, donkey-pulled carts are available as transportation; these are cheaper than the public transportation. Alternatives include the "rigshaws"<sup>1</sup>, which are run as a private transportation system, and these charge more, ranging from 100-300 SDD.

In the locality as a whole, there are 14 government health centres, 6 dispensaries and 15 outreach units, which represent the primary health care system. Outreach units mainly provide immunization services within the Extended Programme of Immunization (EPI) and nutritional services.

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<sup>1</sup> A motorcycle with 3 wheels which carries up to 3 persons.

In addition, there are 43 NGOs, which are largely concentrated in the camps. There are 3 first referral hospitals (Turkey, Jebel Awlia and Bashair) which represent the second level of the health delivery system. Turkey and Jebel Awlia hospitals serve the Kalaklat health area, while Bashair hospital serves both Azhari and Nasr health areas.

Jebel Awlia was chosen as the site of study because the case loads at the first referral hospitals vary between medium and high, so the recruitment of an adequate sample size would be possible in the time frame set. In addition, it was feasible to conduct the study in terms of manpower, transport and budget in the locality. All 3 hospitals were included in the study.

### **3.2 Study population**

The population consisted of children between 2 months and 5 years with cough and /or difficult breathing of duration of less than 3 weeks, admitted to any of the three hospitals in the study period.

Inclusion criteria:

- All children aged 2 months to 5 years with cough/difficult breathing of duration of less than 3 weeks admitted in the paediatric ward in the 3 hospitals.
- All children aged 2 months - 5 years diagnosed as pneumonia (regardless of its classification) and with other co-morbidities (malnutrition, anaemia, malaria) in the 3 hospitals.

Exclusion criteria:

- Seriously ill children (unconscious, having convulsions, in severe respiratory distress) were excluded for ethical considerations
- Children less than 2 months old. These children are managed differently than older children. Pneumonia, sepsis and meningitis all present in a similar manner, therefore it would be difficult to make meaningful conclusions on the management of pneumonia in this age group.
- Children older than 5 years

### **3.3 Sample size**

This study was a descriptive one, describing and quantifying the process children go through until they reach a first referral hospital, and how they are managed once they are admitted at a hospital. At each stage of that process different questions can be asked, and associations between certain variables can be revealed. The procedure that was followed in this study was to recruit all eligible cases within four month of data collection. It then would be possible to see which questions could be answered by the recruited sample size. It would also be possible to find associations that can form a basis for different hypothesis, which can then be tested using different study designs.

### **3.4 Research tools**

Data was collected using a variety of tools to obtain the required information (Annex 1). A structured questionnaire was administered to caretakers of children under five who were admitted in the paediatric ward, to identify the care seeking process before reaching the hospital. The questionnaire was used in a face-to-face interview with the caretakers. It contained demographic characteristics of the child, signs and duration of that episode of illness, care sought outside the home, whether the child was referred and whether he/she received pre-referral treatment and costs of care until the child reached the hospital. Patient admission files were used against a checklist to determine the practice of case management. Case management was evaluated by the correct use of signs to match with classification; the correct use of antibiotics to match with classification and the duration of antibiotic administration according to WHO guidelines. In addition, a structured observation list was used to assess the hospitals' equipment necessary for ARI management and the bed capacity. Hospital bed capacity and staffing were obtained from hospital officials. Hospital monthly statistical reports were used to calculate the magnitude of pneumonia in relation to other reasons of admission.

### **3.5 Variables and definitions**

The following variables were included in the study:

- characteristics of child
- care seeking
- standard case management:
  - a) Assessment of the child

- b) Classification of the child according to the assessment
- c) Recommended antibiotic choice
- d) Monitoring of inpatients

The definitions used in the study were:

#### Characteristics of child

- Age: recorded in months and grouped as recommended by the WHO into:
  - a) between 2 and 11 months
  - b) between 12 months and 5 years
- Sex: Male or female
- Weight: recorded in kilograms to the nearest 10 grams. This was taken from the patients' file.
- Mother's age: measured in years; recorded as a continuous variable and categorized after the data collection.
- Mother's education: recorded as a continuous variable (number of years of education), and categorized after the data collection into none, primary (1-8 years of education), secondary (9-12 years) and higher (>12 years).
- Family income: pre-categorized into high, middle and low income according to the Sudanese *Diwan Azakat*<sup>2</sup>. On converting this monthly family income into US dollars:
  - High income corresponded to > \$ 225
  - Middle income: \$112 - \$ 225
  - Low income: < \$ 112

This was approximated to the respondent by the daily allowance he/she used.

#### Care seeking behavior

Variables regarding care seeking were identified from the interviews with the caretakers.

- Recognition of symptoms that prompted care seeking
- Duration (in days) of symptom/symptoms before seeking care
- First action taken since recognition of symptoms: using a home made remedy or a self prescribed drug, or taking no action.
- Decision maker to seek care outside the home

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<sup>2</sup> Sudanese social security system based on Islamic regulations.



- Type of first care provider/source: one of the 3 hospitals in the locality, another government hospital, private sector, health center, NGO or other.
- Distance of first provider sought from the home: this was pre-categorized into <5 km, 5-10 km and > 10 km. Caretakers were helped to approximate the distance by asking them to compare it to a distance familiar to them. For example, if the distance was nearly the same as (or more or less) than that from the market place to the hospital.
- The reason why the caretaker didn't attend the closest provider, if that applied. This was categorized after the data collection.
- Referral by a health worker from a primary health care facility: whether caretakers were referred to a hospital immediately, and whether they were given pre-referral treatment and a referral note.
- Time and cost taken to reach a hospital.

#### Standard case management (following WHO's guidelines)

Variables used to identify SCM were extracted from the patients' files in the following way:

##### 1- Assessment:

The child's assessment was determined if he/she was assessed for the following clinical features by the recording of the symptoms/signs on the inpatient file, whether negative or positive:

- cough, difficulty breathing, chest indrawing, central cyanosis, inability to drink/breastfeed, convulsions/lethargy, respiratory rate count and wheeze.

##### 2- Classification:

Classification in relation to the assessment tasks that were performed for the child (figure 3.1):

- very severe pneumonia
- severe pneumonia
- pneumonia

Figure 3.1 Classification of the severity of pneumonia for the child with cough/difficult breathing

Age	Classification	Sign or symptom
2 months to five years	Very severe pneumonia	<ul style="list-style-type: none"> <li>• chest indrawing plus at least one of the following</li> <li>• central cyanosis</li> <li>• unable to drink/breastfeed</li> <li>• convulsions/lethargy</li> <li>• severe respiratory distress</li> </ul>
	Severe pneumonia	<ul style="list-style-type: none"> <li>• fast breathing*</li> <li>• chest indrawing</li> </ul>
	Pneumonia	<ul style="list-style-type: none"> <li>• fast breathing*</li> </ul>

\*fast breathing: age 2-11 months 50 breaths /minute

Age 12 months – 5 years 40 breaths/minute

### 3- Antibiotic choice

The administration of a recommended antibiotic according to the classification.

Type of antibiotic for children 2 months -5 years:

- Very severe pneumonia: chloramphenicol, or if it's not available benzyl penicillin and gentamicin.
- Severe pneumonia: benzyl penicillin
- Pneumonia: cotrimoxazole

### 4- Monitoring of inpatients

- Frequency of monitoring by sisters' and/or doctors expressed in hours.
- Signs that are monitored and recorded.

### Associated condition (co-morbidities)

These were recorded as diagnosed by the clinician who made the diagnosis of the child. However, laboratory results from patients' files were recorded when available.

- Malaria: clinical diagnosis, or confirmed by blood film for malaria parasite.
- Anaemia: clinical diagnosis or haemoglobin level less than 9.3 mg/dl

- Malnutrition: weight-for-age below the 3<sup>rd</sup> percentile, based on the US National Center for Health Statistics (NCHS) reference <sup>(43)</sup>.

#### Duration of antibiotics which were administered at the hospital

- Categorized into the total hours that the antibiotics were administered.

### **3.6 Data collection**

A small pilot study was conducted in a hospital that was not included in the study and not in Jebel Awlia locality. The questionnaire was translated into Arabic before the pre-testing. The aim of the pilot study was to pretest the questionnaire to check whether respondents understood it and followed its sequence. In addition, the feasibility and sequencing of the checklist used to extract information from the patient file was assessed. Subsequent changes were made to the questionnaire; an example of which was that some open ended questions were changed into closed ones.

Data was collected from 31<sup>st</sup> of August until 30<sup>th</sup> of December from Turkey and Bashair hospitals. Jebel Awlia was included from 15<sup>th</sup> of October until the end of the period to ensure the maximum possible sample size. All together, five research assistants were trained in conducting the interviews and filling the structured check list. Particular attention was given to interview techniques when training the assistants, for example not prompting care takers when asking questions. Two of the research assistants were newly graduated medical doctors, while three were newly employed medical doctors. Towards the end of the period of data collection, the hospital statistical records were referred to in order to calculate the magnitude of pneumonia in the study period. Children were recruited into the study from the 3 hospitals following the inclusion criteria mentioned above during the period of data collection. Two hundred and thirty one caretakers were interviewed and information extracted from their children's inpatient files. Seven questionnaires and inpatient files' information was excluded due to missing data. Analysis was performed on 224 cases.

### **3.7 Data handling and analysis**

The questionnaires were collected from the research assistants by the principle researcher on a regular basis throughout the data collection period. They were then checked for accuracy and completeness. When information was found missing,

corrective measures were taken when possible. All questionnaires were kept in order according to the hospital by the principle researcher. Data entry and cleaning was completed by the principle researcher. The Statistical Package for Social Sciences (SPSS version 12) was used for data entry and analysis. General descriptive analyses were used. Cross tabulations for variables that were thought to have an association were performed. The chi-square test and Fisher's exact test were used as appropriate. A P-value of 0.05 was used to determine significance.

### **3.8 Ethical considerations**

Ethical clearance was obtained at the national level from the department of curative medicine in Khartoum State ministry of health. In addition, permission to perform the study and extract information from patient files and hospital statistical records was obtained from the different hospital directors. Verbal consent was obtained from the respondents after an explanation of the interview aims (Annex II). Participation was on a completely free will basis. All approached respondents agreed to participate in the study.

## 4. Results

### 4.1 General characteristics

Two hundred and twenty four children aged 2 months to five years from three first referral hospitals in Jebel Awlia locality were enrolled in the study. Their caretakers were interviewed and information on case management was recorded from their inpatient files. Details of general characteristics are shown in table 4.1.

There was a trend that a higher proportion of male children was admitted in all 3 hospitals (54.5%), although the difference was not statistically significant (Chi-square for goodness of fit ( $X^2 = 1.79$ ,  $P = 0.181$ )). Nearly two thirds of the children (64.3%) admitted were in the younger age group. However, as shown in figure 4.1, there was almost no difference in the ages for males and females; 64% of the male children were in the age group 2-11 months, compared to 65% of the female children. Almost all caretakers were female (97.8%) and mothers of the children (93.3%). The median age of mothers was 27 (range 15 – 45 years) and the majority of mothers (92%) were in the younger age groups. The largest proportion of mothers had only primary education compared with those who had a secondary or a higher education. Almost 80% of the respondents belonged to middle & low-income families.

**Figure 4.1. Child age groups in relation to child sex among 224 children admitted with pneumonia in Jebel Awlia, September-December 2005**

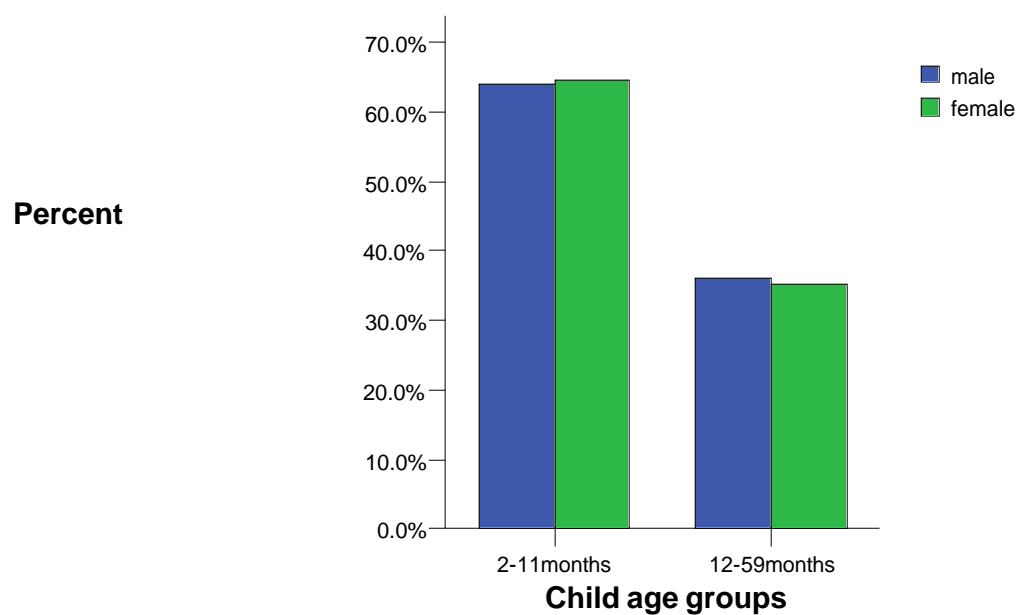


Table 4.1 General characteristics of the children and of their caretakers.

Characteristics	Frequency (percentage)
<i>Child sex</i>	
Female	102 (45.5)
Male	122 (54.5)
<i>Child age (both sexes)</i>	
2-11 months	144 (64.3)
12-59 months	80 (35.7)
<i>Caretakers' characteristics</i>	
<i>Sex</i>	
Female	219 (97.8)
Male	5 (2.2)
<i>Caretaker relationship</i>	
Mother	209 (93.3)
Father	5 (2.2)
Other relative	9 (4.0)
Other	1 (0.4)
<i>Mother age groups *</i>	
15-24 years	100 (47.6)
25-34 years	94 (44.8)
35 years	16 (7.6)
<i>Mother education #</i>	
None	70 (31.4)
Primary	84 (37.7)
Secondary	23 (10.3)
Higher	46 (20.6)
<i>Family income</i>	
High	46 (20.5)
Middle	91 (40.6)
Low	87 (38.3)

\* Fourteen of the caretakers were unsure of the mothers' ages

# One caretaker was a relative who didn't know the mother's education level.

## 4.2 Care before hospital admission

### Signs prompting care seeking

Many different combinations of signs were recognized by the caretakers and prompted them to seek care. For 9% of the caretakers, one sign (namely fever, fast breathing, difficult breathing or cough alone) prompted them to go to a health facility (table 4.2). For the rest of the caretakers, two or more signs were the reason they attended a facility. Two of the signs that are used by the Arabic version of the Sudan

IMCI home card (namely difficult breathing and fast breathing) were the reason for care seeking, in combination with other signs, in 59% of the caretakers.

Table 4.2 Signs that prompted caretakers to seek care outside the home.

	Frequency	Percent
Fever	2	0.9
Fast breathing <sup>a</sup>	1	0.4
Difficult breathing <sup>b</sup>	7	3.1
Cough	10	4.5
Difficulty &/or fast breathing	133	59.4
Other combination of signs	71	31.7
Total	224	100.0

a. This was mentioned as the only sign that prompted care seeking.

b. Same as a.

c. These were mentioned in combination with other signs.

d. Here, difficulty breathing and fast breathing were excluded.

Mothers lesser than 35years old reported fast/difficult breathing more often than those in the older age group (55% vs. 4%), but this was not significant (Fisher's exact test  $P = 0.681$ ). Also mothers with only primary education reported the same 2 signs more often than those with a higher education; again the difference was not significant (Fisher's exact test  $P=0.415$ ). In addition, difficult and fast breathing were more often reported in infants than in older children (39% vs. 20%) and in males more than in females (31% vs. 29%), but these differences were not statistically significant (Fisher's test:  $P = 0.171$  and  $0.584$  respectively).

### **Actions taken by caretakers since signs were recognized**

Two fifths of the caretakers (89) took no action and sought care outside the home as a first line of action (table 4.3). Thirty percent of the caretakers used a home made remedy as opposed to 17% who used a self-prescribed drug. Home made remedies



included hibiscus in 2%, honey in 5%, "garad"<sup>3</sup> in 21% and sesame oil in 33%, all either alone or in different combinations.

Table 4.3 Action at home, duration till care sought and the decision maker in 224 children.

	<i>Frequency (percentage)</i>
<i>Action first taken at home</i>	
Home remedy	68 (30.4)
Self prescribed drug	37 (16.5)
Both home remedy & self prescribed drug	24 (10.7)
Other action taken #	6 ( 2.7)
No action	89 (39.7)
<i>Duration till care sought *</i>	
Within 24 hours	105 (47.3)
1-2 days	73 (32.9)
3-4 days	30 (13.5)
5-7 days	9 (4.0)
More than 7 days	5 (2.3)
<i>Decision maker</i>	
Mother	190 (84.8)
Father	20 ( 8.9)
Other relative	14 ( 6.3)

# Tepid water sponging in 5 cases and rice water in the other.

\* Two of the caretakers weren't sure of the duration.

Younger mothers tended to use more self prescribed drugs and sought care outside the home as a first line of action more often than the older mothers, while mothers in the middle age group used more home remedies. These differences however showed no statistical significance using Fisher's exact test ( $P = 0.955$ ).

Infants received more self prescribed drugs and home remedies compared to older children. Moreover, care was sought immediately outside the home more often for infants than for older children. These differences were not significant using the Chi-square test ( $X^2 = 2.83$ ;  $P = 0.588$ ). Similarly males had more self prescribed drugs and home remedies than females; and were taken outside the home for care more often (not significant using Chi square test  $X^2 = 1.42$ ;  $P = 0.841$ ).

<sup>3</sup> This is the dried fruit of the *Accacia nilotica* tree.

Low income families were the most likely to take no action at home, but rather seek care outside the home as their first action (18% compared to 13% and 9% of the middle and high income families respectively), while high income families used a self prescribed drug and a home remedy the least (Table 4.4). On the other hand, the middle income families were the most likely to use a home remedy and self prescribed drug. These differences were found to be statistically significant (Fisher's exact test = 15.99; P= 0.033).

Table 4.4 Actions taken at home by caretakers of different income levels in Jebel Awlia (N=224).

		Action at home						
		Self-drug	No action	Other	Home remedy	Combination of self-drug and home remedy	Total	
Family income	High	8	20	2	7	9	46	
	% of Total	3.6%	8.9%	0.9%	3.1%	4.0%	20.5%	
	Middle	20	29	2	33	7	91	
	% of Total	8.9%	12.9%	0.9%	14.7%	3.1%	40.6%	
	Low	9	40	2	28	8	87	
	% of Total	4.0%	17.9%	0.9%	12.5%	3.6%	38.8%	
Total		37	89	6	68	24	224	
		% of Total	16.5%	39.7%	2.7%	30.4%	10.7%	100%

### Duration till care was sought outside the home

Almost half (47%) of the caretakers sought care for the child within 24 hours of their recognition of the signs, and a further 46% did so after one and up to four days (table 4.3). Two percent delayed seeking care for more than seven days. There was no significant difference according to the mother age groups and in the duration till care was sought using Fisher's test (P = 0.217).

Figure 4.2 shows that 52% of the female children were taken to a provider within twenty four hours compared to 43% of the male children, although this was not statistically different using Fisher's exact test ( $P = 0.195$ ). Although it appeared that caretakers were faster to seek care outside the home for infants than for older children, this didn't reach significance (Fisher's test;  $P = 0.235$ ) (table 4.4).

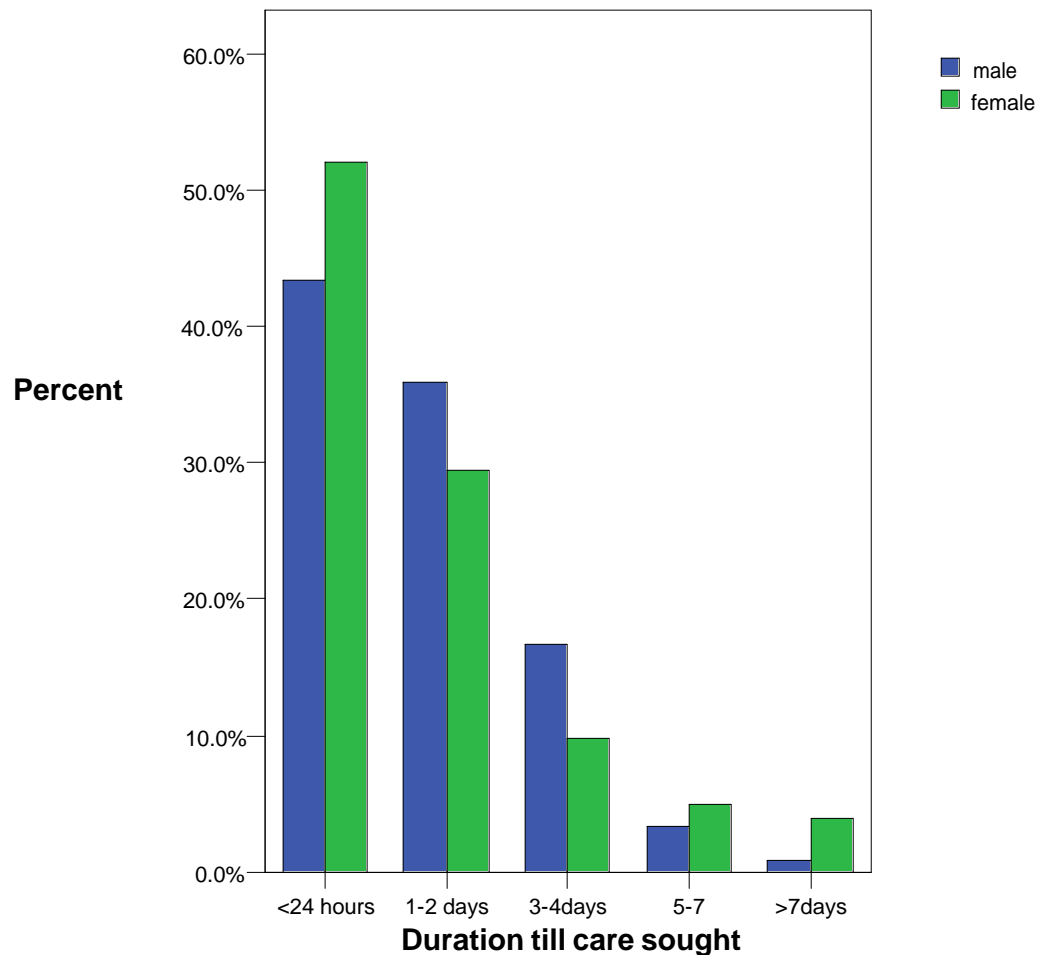


Figure 4.2 The distribution of child sex in relation to the duration of time till care was sought outside the home in 222 children in Jebel Awlia.

Table 4.4 The duration till care was sought outside the home in the 2 child age groups in 222 children in Jebel Awlia.

			Duration till care sought (days)					
			<1	1-2	3-4	5-7	>7	Total
Child age groups (months)	2-11	Count	60	51	23	6	3	143
		% of Total	27.0%	23.0%	10.4%	2.7%	1.4%	64.4%
	12-59	Count	45	22	7	3	2	79
		% of Total	20.3%	9.9%	3.2%	1.4%	0.9%	35.6%
Total		Count	105	73	30	9	5	222
		% of Total	47.3%	32.9%	13.5%	4.1%	2.3%	100.0%

The duration till care sought showed a statistically significant variation with the family income (Fisher's exact test 16.89;  $P = 0.019$ ). Table 4.5 shows that high income families were the least to seek care within 4 days of caretakers' recognition of signs, while middle income families sought care more often within 24 hours. Low income families sought care more often between 1 and 4 days of sign recognition. Furthermore, all the cases of delayed care seeking of more than 7 days were in the low income group.

Table 4.5 the duration till care was sought outside the home within the different income levels of 222 families in Jebel Awlia.

			Duration till care sought (days)					
			<1	1-2	3-4	5-7	>7	Total
Family income	High	Count	28	9	7	1	0	45
		% of Total	12.6%	4.1%	3.2%	0.5%	0.0%	20.3%
	Middle	Count	45	31	9	6	0	91
		% of Total	20.3%	14.0%	4.1%	2.7%	0.0%	41.0%
	Low	Count	32	33	14	2	5	86
		% of Total	14.4%	14.9%	6.3%	0.9%	2.3%	38.7%
Total	Count	105	73	30	9	5	222	
	% of Total	47.3%	32.9%	13.5%	4.1%	2.3%	100%	

### **The decision maker**

In 85% of the sample population, it was the mother who took the decision to seek care for the sick child outside the home (table 4.2). Even though the mother took the decision to seek care outside the home more often if the child was a male (46% for a male vs. 38% for a female) and if the child was an infant rather than if he/she was older (55% vs. 30%); this association was not significant using the Chi-square test ( $X^2 = 2.89$ ;  $P = 0.236$  for child sex and  $X^2 = 3.82$ ;  $P = 0.148$  for child age).

### **Patterns of health facilities attended**

In 137 (61%) of the caretakers, one of the three first referral hospitals in the locality was the first provider they sought care at, while 37 (17%) went to the private sector (figure 4.3). None of the respondents reported seeking care from a traditional or religious healer. Table 4.6 shows that 9 % of the caretakers who took the child to the private sector were in the low income group, compared to 2% and 5% of the high and middle group respectively. The same table indicates that the low income group sought care more often at one of the 3 hospitals than their counterparts. These differences were statistically significant using Fischer's exact test ( $p = 0.007$ ).

Sixty nine percent (155 out of 224) of the caretakers sought care at the facility they perceived to be closest to them, which was one of the 3 referral hospitals in 86 of the caretakers (56%) (Table 4.7). The same table shows that almost equal proportions of these caretakers sought care first at either a health centre or the private sector (19% and 18% respectively). The same table shows that for 90% of the caretakers who sought care at the facility they perceived closest, all forms of the health care systems (primary, secondary and private) were within 5 km.

Of the 66 (30%) caretakers who first attended a facility which was not the perceived closest one, 76% went to one of the 3 referral hospitals; 5% went to another governmental hospital and 14% went to the private sector. Sixty eight percent of these caretakers bypassed a health centre and 15% bypassed a hospital which was within 5 km of their homes (table 4.8).

Several reasons were mentioned for bypassing. A third of the caretakers stated that certain services were not available at the health centres they bypassed. These services

included oxygen, parenteral antibiotics and x-ray facilities. Twenty one percent said that they were used to go to the hospital, even though it wasn't the closest facility to their homes. Four of these had relatives working in hospitals they sought care at. Another 21% expressed lack of trust in health providers at the facilities they bypassed, and that they thought that hospitals provided better management. A further 12% stated that the facilities closest to them were closed at the time they sought care, that being outside their working hours.

Figure 4.3 The distribution of the first health facilities attended by 224 caretakers.

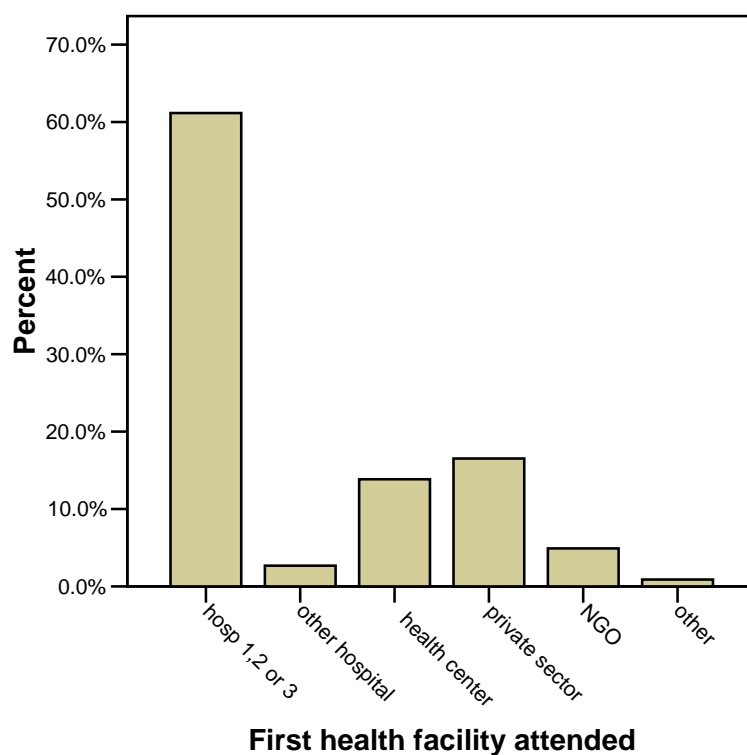


Table 4.6 The patterns of health facilities attended by caretakers of different income levels (N=224).

		First provider							
		Hosp. 1,2 or 3	Other hospital	Health center	Private sector	Other	NGO	Total	
Family income	High	26	2	12	5	0	1	46	
	% of Total	11.6%	0.9%	5.4%	2.2%	0.0%	0.4%	21%	
	Middle	54	1	15	12	1	8	91	
	% of Total	24.1%	0.4%	6.7%	5.4%	0.4%	3.6%	41%	
	Low	57	3	4	20	1	2	87	
	% of Total	25.4%	1.3%	1.8%	8.9%	0.4%	0.9%	39%	
Total		137	6	31	37	2	11	224	
		% of Total	61.2%	2.7%	13.8%	16.5%	0.9%	4.9%	100%

Table 4.7 First providers (which were perceived as closest) where caretakers sought care and their distances (N=154).

		Distance of first closest facility			Total
		<5km	5-10km	> 10km	
First provider	Hosp. 1,2 or 3 <sup>a</sup>	72	10	4	86
	% of total	46.8%	6.5%	2.6%	55.8%
	Other hospital <sup>b</sup>	3	0	0	3
	% of total	1.9%	0.0%	0.0%	1.9%
	Health center	29	0	0	29
	% of total	18.8%	0.0%	0.0%	18.8%
	Private sector	27	1	0	28
	% of total	17.5%	0.6%	0.0%	18.2%
	NGO	8	0	0	8
	% of total	5.2%	0.0%	0.0%	5.2%
	Total <sup>c</sup>	139	11	4	154
	% of total	90.3%	7.1%	2.6%	100.0%

a. This was one of the 3 referral hospitals where the children were recruited.

b. This was actually hospital 3, but these 3 children were recruited at hospital 1.

c. One caretaker wasn't sure of the distance.

Table 4.8 The distribution of health facilities that were bypassed by caretakers and their distances (N=66).

			Distance to closest facility		
			<5km	5-10km	Total
Closest facility	Health centre	Count	45	2	47
		% of Total	68.2%	3.0%	71.2%
	Other hospital	Count	10	1	11
		% of Total	15.2%	1.5%	16.7%
	Other	Count	8	0	8
		% of Total	12.1%	0.0%	12.1%
Total	Count	63	3	66	
	% of Total	95.5%	4.5%	100.0%	

### 4.3 Pre-referral management

Of the total caretakers, (87) 39% didn't go to one of the 3 hospitals immediately, but to another provider first (regardless of the distance and whether that was the perceived closest provider). Table 4.9 shows the providers that these caretakers took their children to. Three of the "other government hospitals" were actually hospital 3, where the caretakers took their child first, but at the time the interview was conducted they were recruited from hospital 1. It can be seen from the table that the largest proportion attended the private sector (43%) followed by government health centres (36%).

Table 4.9 Providers (other than the 3 hospitals) where the caretakers first sought care at (regardless of distance).



	Frequency	Percent
Other government hospital <sup>a</sup>	6	6.9
Government health centre	31	35.6
Private sector	37	42.5
Other <sup>b</sup>	2	2.3
NGO	11	12.6
Total	87	100.0

a. In 2 occasions, this was hospital 3; in the others, it was a hospital outside the locality.

b. One of these was a pharmacy, the other a medical assistant who visited the child at home.

Out of 85, the remaining 34 (40%) were referred immediately to one of the 3 referral hospitals (where they were recruited), while 51 (60%) were not. Two cases were excluded from this analysis; in one case the provider was a medical assistant who visited at home and therefore the question of referral was inapplicable. In the other, the question was incorrectly unanswered. Table 4.10 shows that 18 children out of the 34 (53%) referred ones were given pre-referral treatment, while 16 were referred without any type of treatment administered.

The treatment given to 18 who were referred was as follows:

- oxygen and antipyretics in 2 occasions
- parenteral antibiotics (mostly penicillin) in 10 occasions
- an oral treatment in 5 occasions; the caretaker knew that to be an antibiotic in 2 occasions
- a nasal decongestant in 1 occasion

Table 4.10 also shows that 30 children out of the 34 (88.2%) were referred with a referral note, while the rest were not. Less than half these children (47%) received both pre-referral treatment and a referral note. The majority of caretakers (91.2%) complied with the referral decision within 24 hours. Table 4.11 shows the treatment that was prescribed to the children who were not referred to the hospitals immediately.

Table 4.10 The children who were referred with a referral note and pre-referral treatment

			Referral note		
			Yes	No	Total
Pre-referral treatment	Yes	Count	16	2	18
		% of Total	47.1%	5.9%	52.9%
	No	Count	14	2	16
		% of Total	41.2%	5.9%	47.1%
Total		Count	30	4	34
		% of Total	88.2%	11.8%	100.0%

Table 4.11 The treatment prescribed to children who were not referred to the hospitals immediately. (N=50)

	Frequency	Percent
Benzyl penicillin alone or with other <sup>a</sup>	12	24.0
Oral antibiotic alone or with other <sup>a</sup>	23	46.0
Oral treatment	12	24.0
Other <sup>b</sup>	3	6.0
Total <sup>c</sup>	50	100.0

a. This was any of a cough syrup, antipyretic, bronchodilator or antimalarial.

b. These were different combinations of antipyretic, cough syrup, nasal decongestant and an investigation done for the child.

c. One was excluded because the question was incorrectly answered.

### Costs at the first referral hospital

More than two thirds (68%) of 221 caretakers (3 didn't know) arrived at one of the 3 referral hospitals in less than half an hour, 25% did so between half an hour and an hour, and 7% did so in more than an hour. The majority (90%) of the caretakers paid less than SDD 500 to reach one of the 3 hospitals, and only 3 (1.5%) paid more than SDD1000. Once at the hospitals, more than half of the caretakers (57%) did not pay any fee for doctor consultation while 43% paid an amount ranging from SDD 150 to SDD 750 (with a mean of SDD 309  $\pm$  70.11). Seventy four percent (out of 189

caretakers who answered this question) paid an average of SDD 645 for drugs, ranging from SDD 100 to SDD 2700. There were extra costs including laboratory investigations (blood smears for malaria, haemoglobin levels and X-rays) and simple equipment like cannulas and empty syringes. Sixty five percent of the caretakers paid extra costs at an average of SD 593.

Almost half the children (48%) were transferred from the OPD to the ward in less than half an hour; in 22% it took up to 1 hour, and in 30% it took more than 1 hour.

#### **4.4 Pneumonia inpatient caseload**

Hospital statistical records were used to calculate the pneumonia workload in the inpatient wards. The same age groups as used in the hospital monthly reports will be followed in the presentation of results (< 1 years, 1-4 years, and 5-14 years). Altogether, 9 283 patients, of all ages, were admitted in the three hospitals during September through to December 2005. Of these, 2 520 (27%) were admitted in the paediatric ward. Of the children admitted in the paediatric ward, 2 150 (85%) were under five years of age (this percentage is missing the December number for hospital 3). The total number of children under five who were diagnosed as pneumonia and admitted as inpatients was 812 (37.8%). Four hundred and eighty three (59.5%) of these were less than one year, and 476 (58.6%) were males. Four hundred and ninety three (60.7%) were admitted in the “short stay”, meaning they were discharged within the first twenty four hours of their hospital admission.

#### **4.5 Standard case management**

##### **Assessment**

In all 3 hospitals, the two most recorded clinical features extracted from inpatient files’ were cough and fever (92.4% and 92.0% respectively). The respiratory rate count and difficulty breathing were the next two most recorded clinical features (70% and 66.1%). On the other hand, chest indrawing drops to 57%; in 53% cases in which it was present. Wheezing was recorded in slightly less than a third of the children (32%), where it was present in 28%. Of the 3 danger signs used to determine the classification of very severe pneumonia, (namely cyanosis, convulsions and inability

to drink), cyanosis was the most commonly assessed at 56%. Convulsion followed at 31%. Inability to drink, however, was recorded in only 9% of the cases.

Only 3 children, all 3 hospitals included, were assessed for 9 signs/symptoms; one child in hospital 1 and 2 children in hospital 2. Hospital 1 had the highest recorded percentage of both chest indrawing and cyanosis (70% and 87% respectively), while hospital 2 had the highest in inability to drink and convulsions (14% and 58% respectively). Hospital 3 had the lowest percentage of recording of the 3 danger signs (table 4.12).

Table 4.12 The recording of signs that determine the classification of very severe/severe pneumonia in the 3 hospitals.

<b>Signs recorded</b>	<b>Hospital 1, n=108</b>	<b>Hospital 2, n=52</b>	<b>Hospital 3, n=64</b>	<b>Total n=224</b>
Chest indrawing	76 (70.4%)	19 (36.5%)	32 (50.0%)	127 (56.7%)
Cyanosis	94 (87.0%)	27 (51.9%)	4 (6.3%)	125 (55.8%)
Inability to drink	10 (9.3%)	7 (13.5%)	4 (6.3%)	21 (9.4%)
Convulsions	35 (32.4%)	30 (57.7%)	4 (6.3%)	69 (30.8%)

### **Index of integrated assessment tasks**

An index of integrated assessment tasks was used to determine the case management that children received<sup>(44)</sup>. The tasks chosen were adapted from the WHO symptoms and signs used to assess children with cough/difficult breathing and classify them into the different categories of pneumonia<sup>(15)</sup>. The index consists of nine tasks and gives equal weight to each task performed (score per task done = 1). It is expressed as the mean of the number of tasks performed in each child, out of those that should have been performed. For all three hospitals, the mean calculated was 5 out of the 9 tasks chosen. Hospital 3 had the lowest index (3.4) compared to hospital 1 or hospital 2 (5.8 and 5.4 respectively).

### **Classification**

In the following presentation of results, diagnosis will be used in a context to mean that which is recorded in inpatient files by health providers, while classification will indicate that which was actually possible according to the assessed tasks each child received.

In all 3 hospitals, 15 out of 224 children (7%) had no diagnosis recorded in their inpatient files. Fourteen children (6%) were diagnosed as severe pneumonia, even though they had one or more danger signs and should instead have been diagnosed as very severe pneumonia (table 4.13). On the other hand, 138 children (62%) who were diagnosed as severe pneumonia had inadequate assessment recorded to make that classification, meaning that the diagnosis of severe pneumonia could not be confirmed. Similarly, 30 (13%) of the children who were diagnosed as pneumonia by health providers had inadequate assessment on the signs indicating severe/very severe pneumonia, also implying that a wrong classification could have occurred. All together, 203 (91%) of the children had inadequate assessment tasks performed in the correct order to determine the category and severity of pneumonia. There was no diagnosis of very severe pneumonia made by health providers in any of the 3 hospitals.

Table 4.13 The diagnosis given by health providers in relation to the classification according to the assessed tasks in 3 referral hospitals in Jebel Awlia. (N=224)

		Classification according to assessed tasks				
		Very severe pneumonia	Severe pneumonia	No pneumonia	Missing assessment	Total
Diagnosis given by health provider	Severe pneumonia	14 6.3%	1 0.4%	0	138 61.6%	153 68.3%
	Pneumonia	3 1.3%	0	1 0.4%	30 13.4%	34 15.2%
	Other <sup>a</sup>	0	0	0	2 .9%	2 .9%
	No diagnosis recorded	0	0	0	15 6.7%	15 6.7%
	Severe pneumonia & other	2 0.9%	0	0	13 5.8%	15 6.7%
	Pneumonia & other <sup>b</sup>	0	0	0	5 2.2%	5 2.2%
	Total	19 8.5%	1 0.4%	1 0.4%	203 90.6%	224 100.0%

a. One of these was recorded as "wheezy chest", the other as ARI.

b. Other diagnoses recorded were malaria, anaemia, gastroenteritis and some/severe dehydration.

Out of the 3 hospitals, hospital 3 had the highest percentage of inadequately recorded assessment tasks (92% versus 91% and 89% for hospital 1 and 2 respectively).

## Treatment

Children were treated with a variety of parenteral antibiotics during their hospital stay. Benzyl penicillin was the most frequently used antibiotic alone in 55 children (24.6%), and it was used with another antibiotic (either concurrently or by initiation) in another 70 children (31%). It was prescribed in combination with salbutamol or hydrocortisone or both in 83 children. Ampiclox was prescribed in 27 children (12%). Out of 55 children who were prescribed only benzyl penicillin as a first line antibiotic, 38 had a diagnosis of severe pneumonia, 10 a diagnosis of pneumonia, 3 a diagnosis of pneumonia plus a co-morbidity and 4 had no diagnosis recorded in their files.

Benzyl penicillin was prescribed as a first line antibiotic and then changed to chloramphenicol in 10 children out of 27 who had treatment initiated by benzyl penicillin and were then switched to another antibiotic. Five of these were diagnosed as severe pneumonia, 4 as pneumonia and other co-morbidity, and 1 as pneumonia. Similarly, benzyl penicillin was stopped and replaced by a third generation cephalosporin in 10 children, 8 of which were diagnosed as severe pneumonia, 1 as pneumonia and 1 as pneumonia with some dehydration.

In the 30 children who received a third generation cephalosporin, treatment was initiated by it in 20 children. Out of the 30, 19 were diagnosed as severe pneumonia, 10 as pneumonia and 1 as pneumonia and other co-morbidity.

A second generation cephalosporin was prescribed in 5 children (1 of those after initiation with benzyl penicillin).

Salbutamol, in a nebulizer form in all instances but one, was prescribed with a parenteral antibiotic in almost a third of the children (32%). Thirty nine (54%) of these had a wheeze according to assessment, 4 (6%) did not and 29 (40%) did not have a record of wheezing in their files. Intravenous hydrocortisone was prescribed in 49 children (22%) in combination with a parenteral antibiotic.

It was noticed that hospital 2 had a higher percentage of prescription of third generation cephalosporin than hospital 1 (48% versus 5%), while in hospital 3 cephalosporins were not prescribed at all.

Out of 88 children who had an indication for oxygen administration according to their assessment, 52 (59%) had oxygen administered and 36 (41%) did not. The rest, 136 (61%), were either not assessed for indications needing oxygen or had no indication and were therefore not given it.

### **Monitoring**

Out of 224 inpatient files, 3 (1.3%) had monitored signs recorded every 3-6 hours and 1 (0.4%) every 6-12 hours. The rest, 70 (31%), had signs recorded more than 12 hourly. The remaining 150 (67%) files had no signs recorded to indicate that patients were being followed up. The respiratory rate was recorded as a follow up sign in 45

children (20%) while chest indrawing was recorded in 14 children (6.3%). Other signs that were recorded included auscultatory signs and the general condition of the child.

### **Antibiotic duration during hospital stay**

In all 3 hospitals, almost a third of the children (32%), were prescribed parenteral antibiotics for more than 72 hours, while 38% were prescribed antibiotics for 24 hours (table 4.14).

Table 4.14 Antibiotic duration for 224 children under five admitted in 3 hospitals in Jebel Awlia.

		Frequency	Percent
Duration in hours	24 hrs	86	38.4
	48 hrs	52	23.2
	72 hrs	13	5.8
	> 72 hrs	72	32.1
	<24hrs	1	.4
	Total	224	100.0

These differences in the duration were statistically significant using the goodness of fit Chi-square test ( $X^2 = 120.96$ ,  $P < .001$ ). Looking at the hospitals separately, more children were admitted (and received antibiotics) for 24 hours in hospital 3 than in hospital 1 or 2 (50% versus 44% and 14% respectively). Moreover, more children received antibiotics for more than 72 hours in hospital 2 (75%) than in hospital 1 (26%) or hospital 3 (8%).

### **Co-morbidities**

Out of 224 children, 155 (69%) had a blood film for malaria parasites carried out. Ten of these (6.5%) had a positive result while 145 (93.5%) had a negative one. Only 2 however had a diagnosis of malaria recorded in their inpatients' files, and 3 had an anti-malarial treatment recorded.



A haemoglobin level was obtained in almost a third of the children (32%). The range of values was from 3 – 12.9 g/dl, with a mean of 8.3 g/dl. Fifty two (72%) of the children had a haemoglobin level measurement below 9.3 g/dl. Further more, 9 (17%) of those had a haemoglobin level below 6g/dl.

When expressing the weight-for-age of children using the NCHS as a reference, 84 out of 217 children (39%) of the children were below the 3<sup>rd</sup> percentile. Looking at the hospitals separately, hospital 3 and 2 had a higher proportion of children below the 3<sup>rd</sup> percentile in comparison to hospital 1 (44% and 39% vs. 36%).

Table 4.15 shows that most of the children with a classification of very severe pneumonia had a weight-for-age less than the 3<sup>rd</sup> percentile. Even with a large percentage of children with inadequate assessment signs (making their classification uncertain) the relationship between the severity of pneumonia and underweight was significant using Fischer's exact test (P = 0.031).

Table 4.15 The classification (according to the assessed tasks) in the cut-off percentiles for underweight children (N=217).

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		Percentiles				
			<3rd	3rd - 97 th	> 97th	Total
Classification according to assessed tasks	Very severe pneumonia	Count	11	8	0	19
		% of Total	5.1%	3.7%	0.0%	8.8%
	Severe pneumonia	Count	0	0	1	1
		% of Total	0.0%	0.0%	0.5%	0.5%
	No pneumonia	Count	1	0	0	1
		% of Total	0.5%	0.0%	0.0%	0.5%
	Inadequate assessment	Count	72	115	9	196
		% of Total	33.2%	53.0%	4.1%	90%
	Total	Count	84	123	10	217
		% of Total	38.7%	56.7%	4.6%	100%

#### 4.6 Hospital staffing and equipment

All 3 hospitals had a working nebulizer and a working oxygen supply in the form of cylinders. Working thermometers were found in hospital 2 and 3, but not in hospital 1. Charts on ARI/pneumonia case management were found only in the OPD of hospital 3 (Table 4.16).

Table 4.16 Equipment and staffing levels in the 3 hospitals.

	Hospital 1	Hospital 2	Hospital 3
Nebuliser	yes	yes	Yes
Oxygen supply	yes	yes	Yes
Thermometer	no	yes	Yes
Case management charts	no	no	Yes
Paediatric beds	35	23	11
House officers assigned to paediatric inpatient ward	NA #	NA #	1
Registrars	0	0	0
Consultants	3	5	1
Medical officers*	6	7	4
Sisters	2	2	0
Nurses	5	13	10
Sisters on day/night duty	2 / 0	1 / 1	0 / 0
Nurses on day/night duty	3 / 2	5 / 2-3	8 / 2

# Information not available; these were rotating every 3 months, and exact figures were not available.

\* These were assigned to the paediatric ward in hospital 1 & 2; in hospital 3 they were responsible for the OPD.

## 5. Discussion

### 5.1 Overview

Our results will be discussed in the view of the WHO guidelines for case management, national and developing countries similar studies on care seeking and management.

The larger proportion of males in our study, with a male to female ratio of 1.2:1, is in agreement with international and national trends that point to pneumonia being more common in males <sup>(20;35;36;42;45;46)</sup>. As a matter of fact, only one of the reviewed studies identified sex of the child as not being a risk factor of acute lower respiratory infections <sup>(47)</sup>. We found that males were more often admitted with cough/difficult breathing in our study, but there was no difference between genders in the young age group of 2-11 months. In addition, infants were more likely to be admitted. These figures reflect data from the hospital monthly reports, where males constituted 58.6% and infants 59.5% of the total admissions of pneumonia in the study period. We also found that pneumonia constituted a considerable proportion of under-five admissions (38%). These figures are similar to that found by Osman, who reported 40% of admissions due to ARI, of which pneumonia constituted three quarters<sup>(36)</sup>. These figures and others underscore the importance of pneumonia as a substantial contributor to child morbidity in Sudan<sup>(15;35;36;40)</sup>. It is also known from the literature that ARI is more common in males and in infants <sup>(1)</sup>.

### 5.2 Care seeking

#### Sign recognition

Caretakers should be able to recognise and correctly interpret the signs of illness in their children, and to seek timely and appropriate medical care <sup>(23;28;37)</sup>. In our study, it was demonstrated that fast breathing and difficult breathing (in combination with other symptoms/signs) were the reason that 59% of the caretakers sought medical care. Our study was not a KAP or ethnographic study designed to identify knowledge

of or local terminology for respiratory symptoms. Nevertheless, our findings indicate a reasonable knowledge about these 2 specific signs, especially given the fact that caretakers were not prompted when asked the reason they had sought medical care. Caretakers' recognition of these 2 signs was higher than what was described by El Tayeb in 2005 and by the CDD/ARI household survey in 1995 in Khartoum, Gezira and Kassala States (these reported 45% and 34% respectively) <sup>(37;41)</sup>. This increase might reflect the health communication activities conducted by the IMCI programme since its implementation in Khartoum in 1997. Nevertheless, more work is needed in communication activities to achieve higher levels of knowledge and recognition of pneumonia signs in caretakers.

The fact that these 2 signs were not mentioned alone as reasons for care seeking is noteworthy. The Sudan IMCI survey reports that most caretakers had missed the breathing problem in their children or had not paid particular attention to it alone <sup>(42)</sup>. Caretakers, almost always mothers, are very attentive to subtle changes in their children's behaviour, e.g. feeding and sleeping patterns or excessive crying, as was found in India <sup>(28)</sup>. It might be that in our study, mothers' primary concern was not the breathing problems; therefore more sensitization to these signs of pneumonia is required.

It was found that mothers in Egypt, Nigeria & Ethiopia were able to recognise symptoms/signs like rapid and difficult breathing, fever, grunting and decreased feeding, even though this recognition was not used to seek appropriate care in Egypt and Ethiopia <sup>(24;25;48)</sup>. EL Tayeb in her thesis demonstrated that there was a significant increase in mothers' knowledge about symptoms and signs that warrant seeking health care after a health education programme <sup>(37)</sup>.

The symptoms/signs reported by caretakers did not show a significant relationship with the mother age or education. The relationship between maternal education and care seeking is a complex one and studies have given different results on it. In agreement with our study was one from Zimbabwe <sup>(32)</sup>. On the other hand, it was demonstrated that in Nigeria and Kenya formal education had a positive influence on maternal knowledge on pneumonia signs <sup>(48;49)</sup>. It could be possible that our sample size was not large enough to show significance except in marked associations.

### **Action at home**

The largest proportion of caretakers in our study sought care outside the home as a first line of action (40%), followed by those who used a home remedy (30%) and a self prescribed drug (17%). Higher usages of home remedies were reported in Ethiopia for ARI, in Zimbabwe for cough and in Nigeria for childhood illnesses<sup>(24;32;50)</sup>. Also a higher proportion of parents reported using self-prescribed antibiotics in Ghana than in our study<sup>(31)</sup>. The higher proportions of seeking medical care in our study might be explained by the extensive health care system network in the locality, or it might point to a high confidence in the health system.

It is important for caretakers to know that home made remedies can be used for children with cough or colds, but it is also essential that they know when to seek medical care. El Tayeb found almost the same home remedies as found in our study in a village north of Omdurman city. She demonstrated an increase in the knowledge of management of mild ARI at home using home made remedies<sup>(37)</sup>.

The mother's age, child sex and age were not significantly associated with the caretakers' action at home. We found that family income was the only factor significantly associated with the caretakers' action at home, where high income families were the least to seek care outside the home and the most to use a combination of self prescribed drug and home remedy. Pillai et al. explained a similar phenomenon of high income families seeking care less often in India by suggesting that higher income families have the resources needed to seek care later in the course of the disease should it not resolve<sup>(51)</sup>.

### **Duration till care sought**

Almost half (47%) of the caretakers in our study sought care within 24 hours of recognition of signs in their children. This is a higher proportion than reported in 2003 in the Sudan IMCI survey (32%), and also higher than what was found in Nigeria (23%)<sup>(42;50)</sup>. Again, a possible explanation for this relatively higher proportion in our study might be the extensive health system coverage in the locality. Even higher rates were found in Bangladesh where 62% of the study population sought care within 24 hours of case detection<sup>(30)</sup>.

The mothers' age didn't influence the duration till care was sought for the child, neither did the child's age or sex. The only factor significantly influencing the duration till care sought was the family income. High income families were the least to seek care in the first 4 days of caretakers' recognition of symptoms/signs. Low income families were the most frequently seeking care from 1-4 days. It is a surprising finding that high income families are the most common to delay care seeking outside the home. It might be that higher economic status assures adequate resources for a wider choice of health services (e.g. private in addition to governmental services) should the illness fail to resolve. The possibility of confounding can also explain this phenomenon. For example, higher income families might have working mothers and fathers, which might lead to a delay in care seeking. Unfortunately we were unable to examine such confounding.

From the above, we can see that the families' economic status was the only factor significantly associated with what actions caretakers took, and the duration till care was sought outside the home.

It can be supposed in our setting that the mother has a strong position in the family regarding the decision to take care, since it was the mothers who took that decision in the majority of the cases. As was found in Pakistan, there seems to be no limitation of mobility or autonomy that prevents mothers to seek care outside the home in our setting, in contrast to what was found in Bangladesh, where internal familial and societal constraints prevented care seeking <sup>(29;52)</sup>.

We can explain this phenomenon by the social construction of our community, where fathers work outside the home and it's considered the mother's responsibility to tend to house and child affairs.

### **Patterns of providers sought**

Varying degrees of seeking care for ARI at traditional healers was found across developing countries, ranging from 4% and 18% in Malawi <sup>(53)</sup> to 64% in Ethiopia <sup>(24)</sup>, and to a large extent in both the Philippines <sup>(54)</sup> and Bangladesh <sup>(52)</sup>. We found that none of the caretakers in our study visited a traditional healer. This is an interesting finding that is comparable to other findings from Sudan. In the 1995 household survey conducted in Khartoum, Kassala and Gezira, only 2% of caretakers sought care for ANA and cough from a traditional healer <sup>(41)</sup>. El Tayeb similarly found that 2% of

caretakers took their child with ARI to a traditional healer<sup>(37)</sup>. The non-reporting of traditional healers use in our study might be attributed to the fact that interviews were carried in hospitals (as opposed to the mentioned survey and study). The caretakers might have felt the reporting of contact with traditional healers inappropriate in a hospital setting. On the other hand, it is possible that in Sudan traditional healers do not represent a significant health provider option for ARI symptoms, since these studies used samples that are representative of different states across different geographical areas. Consultation of traditional healers might also be more likely in conditions of a chronic nature (e.g. pain or psychological disorders), while in an illness of acute onset like ARI, medical services are preferred. Traditional healers might also be an option for care seeking where health services are inaccessible and educational levels of parents low. It is still to be established if this pattern of care seeking at traditional healers is the case in other regions of the country, e.g. the southern and western parts.

Most of the caretakers (61%) in our study sought care at one of the 3 referral hospitals in the locality first, regardless of whether they perceived it to be the closest or not. That is expected since these hospitals provide outpatient services in addition to acting as referral hospitals. At the same time, treatment is provided free at government hospitals in the first 24 hours of admission, on the contrary to health centres where caretakers have to pay for treatment. Almost similar trends of care seeking at government health facilities were reported in the CDD/ARI household survey (59%), and higher in El Tayeb's study (75%)<sup>(37;41)</sup>.

Ninety percent of the different levels of the health care delivery system were within 5 kilometres of the study population. This implies that caretakers have a wide range of options to choose from when they are seeking care. Almost equal proportions sought care at the private sector and at government health centres. The private sector was surprisingly popular among our study population, which is noteworthy since the majority of the caretakers belonged to middle and low income groups. Similar results were found in the 1995 survey, where 18% of children with ANA and 12% of those with cough were taken to the private sector<sup>(41)</sup>. Similarly, in Sri Lanka, mothers preferred the private sector<sup>(27)</sup>. El Tayeb, however, reported much lower rates of 1.5% in 2005, possibly due to the rural setting of her study<sup>(37)</sup>. It is likely that

caretakers perceive higher quality services in the private sector, or have higher confidence in private physicians' ability as was found in Egypt<sup>(25)</sup>.

Little research has been done on the quality of services of the private sector in Sudan, and caretakers' perceptions on them. It is an area to look further into in future research.

Almost a third of the caretakers in our study bypassed a facility closest to them, which was a health centre in most cases. Several reasons were mentioned for this bypass. Most caretakers mentioned that services they thought were necessary for treatment were not available at health centres (e.g. oxygen and intravenous antibiotics). There was a preference for hospitals because caretakers perceived that the treatment was better. An element of lack of confidence in health centres was conveyed by some caretakers. Similarly, a lack of confidence in peripheral quality of care was among the reasons mentioned for bypass in another setting in Sudan<sup>(55)</sup>.

### **5.3 Pre-referral management**

Thirty nine percent of our study population first visited a health provider other than the 3 referral hospitals. These were the caretakers who didn't bypass the referral hierarchy. Of these the largest proportion went to the private sector. Looking at referral rates for our study, we found that 40% of these were immediately given a referral decision to a higher level of care (the referral hospitals in this case). All of these complied with the referral decision of the health provider and the great majority did so within 24 hours. In another setting in Sudan (Gezira state) only about half of the children judged in need of urgent referral care reached that care within 24 hours; cost being the most commonly cited barrier to compliance with referral decision<sup>(55)</sup>. It is not possible to know whether in the remaining 60% (who were not immediately given a referral decision by the health providers) the illness severity needed referral, or if these children were under classified by health providers. It is possible that at the time the children were seen by these first providers, their condition didn't need referral and that there was subsequent deterioration in their condition.

Slightly more than half of those referred were given a type of pre-referral treatment which was a parenteral antibiotic in more than half of these cases. Furthermore, less than half of the children who were referred were given both pre-referral treatment and a referral note to the site they were referred to. The numbers in this sub-group of



children was small in our study, making definite conclusions about pre-referral management difficult, but they still suggest that performance in this area is poor. This is particularly true because a similar problem was identified in the IMCI survey where none of the severe cases needing urgent referral received a first dose of antibiotic, and a referral note was prepared and given to half of the referred cases <sup>(42)</sup>.

## **5.4 Case management**

### **Assessment tasks**

In this study, we have found that cough and fever are frequently recorded symptoms (92%) in patient files. These two symptoms were most probably spontaneously offered information by the caretakers. On the other hand, recording of chest indrawing drops to 57%, 53% of cases in which it was present. Since this is a sign that should be actively looked for by health providers to classify severe pneumonia, missing information could possibly have clinical implications for correct classification and thus treatment.

Furthermore, emphasis should be placed on the recording of danger signs like cyanosis, convulsions and inability to drink/breastfeed (whether negative or positive) due to their important implications in both classification and treatment. Convulsions, being an alarming sign for caretakers, could most probably be presumed to be spontaneously offered information by caretakers. Convulsions were reported not present in 29% of our study population; nevertheless 31% is a low percentage of total assessment for an important danger sign. Cyanosis, being a more subtle sign for caretakers to recognize, should be examined for by health workers. In our study, 56% of the children had cyanosis recorded (being negative in all cases). This percent of recording can be considered low, given the fact that emphasis is placed on cyanosis as one of the important signs (to start a general examination of a child with) in pre-service training of health workers. Inability to drink/breastfeed was the most poorly recorded symptom (9%), indicating that health providers failed to ask about it.

Similar results as the above were found in the ARI health facility survey conducted in Khartoum and some central states of Sudan in 1994, where recording of assessment findings was poor; chest indrawing and danger signs were recorded in only 16% <sup>(40)</sup>. Similarly, it was found that in Benin the assessment of children's clinical symptoms and signs was incomplete, giving rise to inadequate management <sup>(20)</sup>.

The respiratory rate count is also an important assessment since its cut-off values determine the classification of pneumonia and no pneumonia. In this study it was recorded in 70% of children. In 1994, a lower percentage was achieved in Khartoum and Central states (33%)<sup>(40)</sup>, increasing to 75% in 2003 in the Sudan IMCI health facility survey<sup>(42)</sup>. However, only 41% of these counts were considered reliable in the latter survey. Higher percentages on respiratory rate counts were achieved in the Egyptian IMCI health facility survey, where in almost two thirds of the children the count was considered reliable<sup>(46)</sup>.

In this study, unlike in others, the child was considered to be assessed for a symptom or sign if it was recorded in his/her inpatient file. Other studies/surveys used observational methods where health providers would be observed during consultations of sick children. Our method could diminish the actual degree of assessment performed for children, since not all symptoms/signs that are assessed by health workers are actually recorded, especially not if they are negative. The low recording of assessment tasks found in our study could be attributed to high case loads seen at hospitals, which could compromise the performance of health providers. This was also mentioned as a reason by health workers in the ARI health facility survey in Khartoum and Central States in 1994<sup>(40)</sup>.

The emphasis, therefore, in this study is on the quantity and quality of recorded symptoms/signs and their adequacy for the given diagnosis for the child. It is of high importance that certain clinical features be recorded to secure correct classification, treatment and follow up of the child. This is clearly a priority for training activities of the CLHP.

### **Classification and treatment**

Our results show that 6% of the children who actually had a classification of very severe pneumonia were diagnosed as severe pneumonia. This percent could very well be higher, since 62% of those children who were diagnosed as severe pneumonia, and 13% of those who were diagnosed as pneumonia had inadequate assessment tasks recorded to make a classification. It appears that there is no clear distinction between very severe and severe pneumonia in the practice of the health providers in the three

hospitals, since no diagnosis of very severe pneumonia was made in any of the hospitals. Furthermore, those who received chloramphenicol or a second or third generation cephalosporin were diagnosed either as severe pneumonia or pneumonia. This discrepancy between classification and treatment, however, did not necessarily mean that children were not treated efficiently. A distinction should be made, as pointed out by Rowe and his colleagues in the Benin study, between incorrectly managed children who were nevertheless treated adequately, and incorrectly managed children where management didn't avert or reduce the risk of death<sup>(20)</sup>. In our study, 4 children died, 1 during the first 24 hours of hospital admission, the remaining 3 after the first 24 hours; giving a case fatality rate of 1.8.

Overall, the large proportion of children who were not adequately assessed to make a correct classification (91%) makes it difficult to determine what percentage was treated correctly. It also emphasizes that this area of case management (assessment and classification to match with treatment) should be focused during pre and/or in-service training of health workers.

Our results show that in the third of children who were assessed for wheeze (and had that recorded), 28% had a wheeze. All the children who were prescribed nebulized salbutamol were also prescribed parenteral antibiotics. Some children with pneumonia present with wheezing. There is, however, a considerable overlap between wheezing and pneumonia. Recently, questions have arisen whether children with wheeze were over-prescribed antibiotics and bronchodilators underutilised<sup>(56-58)</sup>. A study in Khartoum reported a prevalence of 15.4% of bronchiolitis in Khartoum Children's Emergency hospital, but it was diagnosed in only 3.3% by the health providers<sup>(36)</sup>. Most of the bronchiolitis cases in that study were diagnosed as pneumonia. If such confusion between the two disease entities exists, this could have also occurred in our study. It is out of the scope of the present study to identify management patterns for children with wheezing, since we didn't record the frequency and response to bronchodilators. There is a need to collect more information on children with wheeze, to avoid over prescription of antibiotics.

## **Monitoring**

Our results show that only a third of the children had signs that were monitored and recorded in their inpatient files, and two thirds had no signs recorded at all. This low

number doesn't necessarily reflect the quality of ongoing monitoring of children as inpatients. In the study setting, the inpatient re-assessment is performed by the health worker who admitted the child (usually a house officer). It is noteworthy to point out that treatment instructions were renewed daily by the same house officer. Children were also seen in ward rounds by the paediatricians, were re-assessed, and decision on management or discharge taken. It therefore wouldn't be accurate to determine the ongoing inpatient monitoring of children by what is recorded in the files in such a case. It would be safe to state that children were assessed at least once daily by medical staff. The question is again of the quality of recorded information found on patient files, as this is equally important as the assessment itself. Details of the child's condition should be recorded so that they can be reviewed by other members of the staff. Also, information gained by monitoring should be recorded in the child's inpatient file for use by health providers when assessing the child's progress and to guide decision-making concerning further diagnostic tests or changes in treatment. Recording essential information ensures that action to change treatment is taken promptly when the need arises.

In Malawi, information on care provided apart from treatment and transfusion charts, was hardly documented <sup>(59)</sup>. A similar phenomenon of poor inpatient monitoring was found in the Nolan seven country study <sup>(18)</sup>.

Throughout our study, the importance of recording all assessment symptoms/signs, classification, treatment and monitoring has stood out. Without such adequate recording, monitoring and evaluation of a project is not possible. It is critical, therefore, for the CLHP management team to emphasize these during training activities.

### **Co-morbidities**

Almost 40% of the children in our study were below the third percentile of weight-for-age. Twenty five (12%) of the mothers in our study population did not know the exact date of birth of their children. This might have affected the weight-for-age indicator that we used.

The two previous hospital based studies in Khartoum that assessed nutritional status in children with ARI have somewhat different results. Hamza used the same reference (NCHS) but a different cut-off point for malnutrition (those children less than 80% of

the NCHS were considered malnourished)<sup>(35)</sup>. Using this cut-off value, 26% of the cases in his study were malnourished compared to 10% of the controls. The second study by Osman used the Boston standard as a reference, where 7% of the children were below 60%<sup>(36)</sup>.

We believe that, despite the 12% of "questionable" ages, our results reflect the nutritional status of the children in our study population. Higher proportions of children under the third percentile were recruited from hospitals 3 and 2, each of which serves an IDP camp in the locality. Even though some NGOs work to meet the special nutritional needs for infants and young children in the IDP camps, but cultural and tribal heterogeneity which contribute to variations in the food habits and believes, might explain such a nutritional profile.

Many studies have examined the relationship between malnutrition, particularly low weight-for-age, and the incidence of pneumonia or acute lower respiratory infections<sup>(60)</sup>. Studies from Brazil have demonstrated that under-nutrition is a predictor of longer hospital stay<sup>(61;62)</sup>. We were unable to look for such an association, given the limitations of our study. However, despite the fact that the classification of 90% of the children in our study was uncertain, we could find a significant association between the severity of pneumonia and the nutritional status, implying that children below the third percentile had very severe pneumonia more than their counterparts.

The other co-morbidities that we looked at were malaria and anaemia. Sixty nine percent of the total children had a blood smear for malaria parasite performed, 6.5% of which were positive. Only two had a diagnosis of malaria and three had an anti-malarial treatment recorded in their files. This might be due to the fact that children with a positive blood film were prescribed oral anti-malarials and instructions on dose and frequency were given to mothers instead of being written in inpatient files as instructions for nurses.

We also found a high proportion of children with a haemoglobin level below 9.3 g/dl, making them anaemic by the definition set in WHO's guidelines<sup>(15)</sup>. Malaria and anaemia are both common conditions in Sudan. There is an overlap between these two conditions and pneumonia, and the differential diagnosis of a child presenting with cough/difficult breathing include pneumonia, malaria and severe anaemia<sup>(15)</sup>. Several

clinical studies highlighted difficulties in distinguishing malaria and pneumonia in children with cough, fever and fast breathing in Africa, where both conditions are very common and a frequent cause of child deaths <sup>(39)</sup>. These studies underscored the fact that a sick child may have more than one disease at a time. Laboratory services can help in the diagnosis of malaria and anaemia. The reliability of laboratory diagnosis for anaemia however has been questioned by the IMCI survey, which found a sensitivity of 0% and a specificity of 74% between diagnosis done in the field and the National Malaria Administration laboratories <sup>(42)</sup>.

### **Antibiotic duration and discharge**

We tried to determine the duration that parenteral antibiotics were prescribed in the hospital. It is important to note that this reflects the prescription patterns more than the actual administration (receipt) of the parenteral antibiotics by the children. We recorded what was in inpatients' files, but on observing nurses' notes we found that doses were sometimes missed. This is important to pay attention to, since in Malawi missing doses of antibiotics for children hospitalised due to very severe/severe pneumonia contributed greatly to pneumonia case fatality rate <sup>(59)</sup>. We have no data to quantify these missed doses, but we realise that such a phenomenon is worthwhile to investigate in future research; not only due to its important implications in standard case management delivery but also in pneumonia case fatality and bacterial drug resistance. However, for the sake of our discussion, we will assume that children received the parenteral antibiotics in the same manner that they were recorded in their inpatient files. Children were usually discharged after the assigned duration of parenteral antibiotics was met, unless they had another co-morbidity that required a longer hospital stay (e.g. malnutrition). The larger proportion of our study children (38%) were discharged after receiving parenteral antibiotics for twenty four hours, followed by a third who were discharged after seventy two hours. It was difficult to find an association between the classification and the duration that antibiotics were administered, since such a large percent of children had uncertain classification due to the incompletely recorded signs. Such a limitation makes it difficult to compare to WHO guidelines on the recommended duration of parenteral antibiotics. Osman found that 55% of children admitted for ARI in Khartoum Children Emergency hospital were discharged after twenty four hours after a good response to parenteral antibiotics <sup>(36)</sup>. The decision to discharge from hospital should meet a balance between

keeping the child too long in hospital, thus increasing the risk of hospital acquired infections and occupying bed space and staff time, against the premature discharge which increases the risk of relapse and death <sup>(15)</sup>. Studies of childhood deaths from acute illnesses in developing countries have shown that many children died after contact with the health services, in some cases shortly after the child's discharge from hospital <sup>(33;34)</sup>. Many deaths can therefore be prevented by giving careful attention to planning the child's discharge and follow-up. In Sudan, the outcome for children discharged from hospital within twenty four hours has not been documented. This can be an area for future research if current policy of hospital discharge is to be evaluated in the implementation of the CLHP.

We also noted a difference in hospital stay between the 3 hospitals, where hospital 3 had the highest proportion of twenty four hour discharge compared to hospital 2, which had the highest proportion of children staying longer than seventy two hours. This could reflect the severity of illness in children attending hospital 2 compared to the other 2 hospitals. It could also reflect the nutritional status of children attending hospital 2, which served one of the IDP camps in the locality, since malnourished children have a longer hospital stay.

We were unable to witness the discharge of children from the hospital, due to that happening throughout the day. Had we been able to do that, we could have determined whether an oral antibiotic was prescribed, and its duration, then being able to calculate the whole duration of antibiotic treatment.

The 3 hospitals had sufficient equipment to aid in the delivery of sick children management (in the form of nebulizers and oxygen supplies). Standard case management guidelines (in the form of charts) were found in only one hospital. These could help in maintaining a good level of health worker performance on case management even with a rapid turnover rate. Overall, the hospital supplies and staffing levels seemed reasonable, which is encouraging since it will help in delivery of case management if other factors are addressed.

### **Health costs**

Accessibility of health services depends on geographical, economic and/or cultural factors, depending on the different settings. It appears from our results that at least

geographical factors (in terms of distance and travel time) were favourable in our setting, since more than two thirds of the study's population reached a referral hospital in less than half an hour and a further 25% reached it within an hour. That is expected since a good transportation network exists in the locality. Unfortunately, an assessment of cultural influences on accessibility of health services was beyond the scope of our study.

An attempt was made to obtain approximately some of the health care costs borne by families of these children attending a referral hospital. It is hospitals' policies that consultation fees for the OPD are free of charge. Forty three percent of the caretakers paid an average of SDD 309; we were unable to discern at which point this was collected. The larger proportion of the caretakers (74%) paid for drugs an average similar to that found in the IMCI survey in 2003<sup>(42)</sup>. It should be taken into account that some drugs in the hospitals' pharmacy (especially some parenteral antibiotics) are given free for the first 24 hours, but those that are not have to be purchased separately. Ample differences also exist between locally produced and imported drugs.

The issue of health care cost plays an important role in access to care, as poorer families—who are those most in need for care—may be unable to afford services when they need them most. There were indications from an assessment of child health services in eleven states in Sudan that differences existed between and within states regarding fees (for consultation, investigations and treatment), and that there are no documents of a written policy and no clear definition of poor children who need free services<sup>(10)</sup>.

A considerable proportion of children (48%) were transferred from the OPD to the inpatient ward in less than half an hour, and in almost a third this took more than one hour. These proportions are suboptimal, considering that these children had very severe or severe pneumonia and treatment should be started immediately.



## **5.5 Validity and limitation of the study**

There were some limitations and threats to validity at different levels in our study; at the level of selection of our study subjects, information collected and data analysis.

A bias in studying care seeking patterns of caretakers attending hospitals is possible, since care seeking behaviour of other caretakers not having the same access might be different. It was the study's aim to identify care seeking patterns for severe cases that need hospital admission. This doesn't reflect what is occurring at community/locality level, since many illnesses occur at home without reaching hospitals. An alternative approach that could have addressed this concern more appropriately would have been a community based approach. In our situation this was not possible, partly due to limited resources, but more importantly because our aim was also to identify management practices at hospital level, which would have been impossible with a community based study. The questionnaire that was used to identify care seeking was adapted from ARI/diarrhoea and IMCI household surveys which have been previously used in Sudan and elsewhere <sup>(44;63;64)</sup>.

Asking about care seeking practices at health facilities might have introduced a certain degree of information bias. Caretakers might have felt obligated to answer in a desirable way when asked about the first provider they visited or when they sought care outside the home. This might not have been the case had the interviews been conducted at a more neutral ground. However, our retrospective method of studying care seeking was more appropriate than asking about practices (by simulating a case for example), given the location of our study. Our participants had to be enrolled at hospital level to identify management and a retrospective look into their behaviour was thus most appropriate.

Another source of information bias that might have occurred concerns the management which admitted children received. Using information recorded on inpatient files as an indicator of case management might not be very accurate. For example, trying to determine case management in terms of what health workers recorded (whether assessed or monitored signs) might underestimate the true case management that these children received. What is important to note here is that our study is aiming to lay down a baseline for a programme that is based on a well

organised and functioning recording system (the CLHP). Any conclusions drawn on case management, therefore, don't underrate health workers' or systems' performance; rather, it stresses the importance of recording.

Missing information from inpatient files restricted the analysis performed and conclusions drawn. For example, missing information on assessed signs lead to difficulties in reaching a matched classification, which in turn made it difficult to make firm conclusions about treatment received. Another example where restriction occurred due to missing information was that we couldn't get associations between the severity of pneumonia and the duration that the parenteral antibiotic was administered at hospital.

Furthermore, some statistical associations were not achievable, due to small numbers in some categories of certain variables. This limited our ability to identify any association between mothers' education and the duration till care was sought or the first action taken at home.

Our research assistants were not constant throughout the data collection period. A certain degree of interviewer variation is therefore possible. The research assistants were trained to conduct the interviews in a standard procedure, starting from approaching the informant and throughout the interview. During the training we focused on interview techniques, e.g. recording answers to open questions as precisely as they were provided and not probing for answers. Additionally, the main researcher attended the first few interviews conducted by the different research assistants to ensure minimising variations between interviewers. Moreover, on-going supervision was provided for the assistants throughout the data collection period.

Despite these limitations, the study is valuable in highlighting key areas that are important to consider in the implementation of the CLHP.

## **6. Conclusions and recommendations**

### **6.1 Conclusion**

In this study, we looked at care seeking patterns for children before reaching first referral hospitals in Jebel Awlai locality, and the management they received while in hospital.

Care seeking was satisfactory in our study population. Most mothers recognised important signs of pneumonia. There was also no delay in care seeking in the majority of the caretakers. None of the mothers reported taking the child to a traditional healer. We found that for sign recognition, action at home and duration till care was sought, there was no significant difference between genders. The only factor that significantly influenced the type of provider sought and the duration till care was sought was the family income.

Caretakers sought medical care at the referral hospitals in the locality more often than they did at the other health care system providers (health centres, the private sector and NGOs); even though a considerable proportion sought care at the private sector, taking into account the economic structure of our study population. Even when mothers perceived the hospitals as farther away from their homes, they preferred them to other closer health facilities, for reasons such as unavailability of certain services and a lack of trust in health providers in these facilities. Pre-referral management for the children who were referred from other facilities to the hospitals was suboptimal, since less than half of these children received a pre-referral treatment and note.

Recording of assessment signs that were needed to reach a classification was inadequate in the majority of children who were admitted to the hospitals. Danger signs used to classify very severe pneumonia were particularly poorly recorded. With a large percentage of the children with an uncertain classification, it was difficult to draw definite conclusions on the adequacy of the treatment they received. Monitored signs and the progress of the child were not recorded in the majority of inpatient files. Inpatient records are a rich and important source of information on patients. When records are complete, they can help staff members follow up children efficiently. For example, a fully recorded set of signs and symptoms will help staff to recognise new signs as they appear, which will lead to a more precise diagnosis and thus to a more

effective treatment. Also, a fully recorded set of signs and symptoms will help in recognising complications that require additional or revised treatment. The benefits of recording will only be realised when it is done regularly and thoroughly, and appropriate action is taken based on the findings.

All the children who received salbutamol also received a parenteral antibiotic. With a considerable overlap between wheezing and pneumonia, antibiotics could have been over utilised. This could particularly be true since there was no evidence supporting the diagnosis of severe pneumonia in the majority of cases. Also, the larger proportion of children was discharged after receiving parenteral antibiotics for twenty four hours. This could mean that these children either had pneumonia (which doesn't need too be treated with a parenteral antibiotic), or that they had a condition presenting with wheeze and their improvement was due to the bronchodilator they had received.

Overall, the study shows several potential areas to enhance the delivery of standard case management at referral hospital level.

## **6.2 Recommendations**

- High priority should be given in the training of health workers to carry out assessment tasks completely to secure correct classification and treatment. Special emphasis should be placed on the recording of danger signs like cyanosis, convulsions and inability to drink/breastfeed (whether negative or positive) due to their important implications in both classification and treatment. In-service training at the work place would be especially beneficial, since it will allow health workers to review and change their own practices.
- Increase caretakers' recognition of pneumonia signs through extensive health communication activities by strengthening the third component of IMCI (improving family and community practices).

Future research areas:

- Conduct research on children presenting with wheeze and their response to bronchodilators, to avoid the unnecessary use of antibiotics.
- Conduct research on care takers perceptions of the private sector providers, and the quality of care that the private sector offers.

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Ref Type: Generic

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Ref Type: Generic

## Annexes

### Annex 1 Data Collection Tools

University of Oslo

International Community Health

Case management of pneumonia in children under five in Jebel Awlia

#### Questionnaire

Date \_\_/\_\_/\_\_

Interviewer name .....

Q0. Study data Q0.1 Hospital: \_\_\_\_\_

Q0.2 Hospital code: \_\_ [Turkey] 1 [Bashair] 2 [Jebel Awlia] 3

Q0.3 Name of child: .....

Q0.4 Child's ID: \_ \_ \_

Q0.5 Questionnaire #: Q \_\_\_\_\_  
Hcode Child ID

#### Q1. Personal data

Q1.1 Date of birth : \_\_/\_\_/\_\_ Q1.2 Age (months): \_\_\_\_\_

Q1.3 Sex [M] 1 [F] 2

Q1.4 Residence: \_\_\_\_\_

Q1.5 Caretaker sex: [M] 1 [F] 2

Q1.6 Relationship of caretaker to child: Mother [1] Father [2]

Other relative [3] other [4]

☐☐☐

If the informant is the mother ask her:

Q1.7 How many years of education did you have?

none [1] \_\_ \_\_ yrs[2] NA[8] DK[9]

☐

Q1.8 Mother's age: \_\_ \_\_ years [1] NA [8] DK [9]

☐

Q1.9 How much money does the head of the household earn per month?

a. >50 000 SD [1]

b. 25 000 – 50 000 SD [2]

c. <25 000 SD [3]

☐

#### Q2. Morbidity module

*These questions that I will ask you all relate to this current illness, when you first noticed that your child is ill. I will ask you what happened during this time, if anything happened before that; please do not include it in your answers.*

Q2.1. For what reason/reasons did you bring the child to the hospital today?

Tick all signs mentioned, but do not read out the options

a. Child not able to drink or breast feed [1]

b. Child vomits everything [2]

c. Child had convulsions [3]

d. Child was lethargic/unconscious [4]

e. Child developed a fever [5]

f. Child had fast breathing [6]

☐

- g. Child had difficult breathing [7]  
 h. Others (specify) \_\_\_\_\_

**Q2.2 What did you do first when you noticed that?**

*Mention the symptoms/signs she has mentioned from above, don't read out the options)*

- a. Garad [1]  
 b. Honey [2]  
 c. Hibiscus [3]  
 d. Oil [4]  
 e. self-prescribed drug [5]  
 f. other (specify) \_\_\_\_\_ [6]

☐

**Q2.3 How long did you wait to seek care outside the home since you realized the child had this/these symptoms?**

- a. <24 hrs [1]    b. 1-2d [2]    c. 3-4d [3]    d. 5-7d [4]    e. >7d [5]  
 f. NA [8]    g. DK [9]

☐

**Q2.4 Who took the decision that care should be sought outside the home?**

- a. mother [1]    b. father [2]    c. other relative [3]

☐

**Q2.5 Where or from whom did you seek care first outside the home?**

*Write name of facility in space provided*

- a. This hospital [1]  
 b. Other hospital \_\_\_\_\_ [2]  
 c. Government health center \_\_\_\_\_ [3]  
 d. Private physician/clinic/hospital/health center \_\_\_\_\_ [4]  
 e. Pharmacy [5]  
 f. Drug seller [6]  
 g. Relative/friend (outside the household) [7]  
 h. Traditional healer [8]  
 i. Religious healer [9]  
 j. Other provider (specify) \_\_\_\_\_ [10]

☐

**Q3. Provider's module**

*Ask questions Q3.1 & Q3.2 if 2.5a – d was ticked, if Q2.5e – j was ticked skip to question Q3.3.*

**Q3.1 Is this facility the closest to your home?**

- Yes [1]    No [2] → skip to Q3.3    NA [8]    DK [9]

☐

**Q3.2 How far is this facility from your home?**

- a. <5km [1]    b. 5-10km [2]    c. >10km [3]    d. NA [8]    e. DK [9]

☐

*Skip to question 3.6*

**Q3.3 What is the closest facility to your home? \_\_\_\_\_**

☐

NA [8]              DK[9]

**Q3.4. How far is it?**

a. <5km [1]      b. 5-10km [2]    c. >10km [3]    d. NA[8]    e. DK [9]

☐

**Q3.5 Can you tell me why you took the child to that facility and not to the closest one?**

*Ask questions Q3.6-Q3.10 if you had ticked 2.5b – 2.5d.  
If 2.5a or 2.5e – j was ticked, go to Q4.1.*

**Q3.6 Did the provider say your child has to be taken to another hospital?**

Yes [1]      No [2] → *go to Q 3.11*      NA[8]      DK[9]

☐

**Q3.7 Did the health worker administer any type of treatment? (syrup, injection, pills, capsules, intravenous fluids?)**

☐

Yes [1] (specify) \_\_\_\_\_      No [2]  
NA [8]      DK [9]

**Q3.8 Did the health worker give you a referral note?**

Yes [1]      No [2]      NA [8]      DK [9]

☐

**Q3.9 Did you take the child to that hospital?**

Yes [1]      No [2]      NA [8]      DK [9]

☐

**If YES,**

**Q3.10 After how much time did you take the child to that hospital/health center?**

a. <24 hours [1]      b. >24 hours [2]      c. NA[8]      d. DK[9]

☐

**Skip to Q4.1**

**Q3.11 What did the health worker do? Write the exact words of the informant without translation**

---

5

**Q4.1. How long did it take you to get here from your home?**

3

7

7

--	--

--	--

9

9

*Record the following information from the patient file. Tick [YES] if the information is recorded and positive; [No] if it's recorded and negative; and [MISSING] if it's not recorded at all.*

### IN1. ASSESSMENT

#### 1.1 Cough

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.2 Difficulty breathing

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.3 Fever

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.4 Chest indrawing

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.5 Central cyanosis

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.6 Unable to drink/breastfeed

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.7 Convulsions/lethargy

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.8 Wheeze

[YES] 1 [NO] 2 [MISSING] 9 ☐

#### 1.9 Respiratory rate count

..... [MISSING] 9 ☐

#### 1.10 Diagnosis

[Very severe pneumonia] 1 [severe pneumonia] 2 [other] 3 ☐

#### 1.11 Other specify .....

### IN2. CO-MORBIDITIES

*Record if any of the following conditions are present in the file, otherwise tick [NA] not applicable.*

#### 2.1 Malaria, confirmed by BFFM

[Positive] 1 [negative] 2 [NA] 8 ☐

#### 2.2 Malnutrition (weight for age)

[Yes] 1 [no] 2 [NA] 8 ☐

#### 2.3 Anaemia, record Hb level if taken \_\_\_\_\_ ☐

[NA] 8

### IN3. TREATMENT

*Record the treatment from the file and the dose for each day it was administered*

3.1 [Benzyl penicillin 1/2 million IU/6hr for 24hrs] 1 ☐

3.2 [Benzyl penicillin 1million IU/6 hrs for 24hrs] 2

3.3 [Chloramphenicol IV.....]3 3.4 [Ampiclox IV] 4

3.5 [Amoxicillin] 5 3.6[Cotrimaxozole] 6 3.7 [paracetamol] 7

3.8 [salbutamol syrup] 8 3.9 [salbutamol nebulizer] 9

3.10 [Other.....]

10



**IN4. OXYGEN THERAPY**

Is oxygen given as indicated? \* [YES] 1 [NO] 2 NA [3]

\* Indications of oxygen: central cyanosis, inability to drink, severe lower chest wall indrawing, respiratory rate 70/minute

☐**IN5. MONITORING****5.1 Frequency of monitoring**

[<3hrs] 1 [3-6hrs] 2 [7-12 hrs] 3 [>12hrs] 4 [NA] 5

☐**5.2 Monitored signs**

[temperature] 1 [respiratory rate] 2 [level of consciousness] 3

[chest indrawing] 4 [ability to drink or breastfeed] 5 [other] 6

[NA] 7

☐**IN6. Status at discharge**

*Tick status at discharge from the patients' file*

[Deaths within 24 hours of admission] 1

[Deaths after 24 hours of admission] 2

[Discharge before 24 hrs] 3

[Discharge after 24 hrs] 4

[Left against medical advice] 5

[Other \_\_\_\_\_] 6

☐**IN7. Duration of antibiotic**

[Hours that antibiotic was administered at hospital] \_\_\_\_\_

24hrs [1] 48hrs [2] 72hrs [3] >72hrs [4] other ..... [5]

☐**Supplies and staffing form**

1. Does the inpatient ward have a working nebuliser? [YES] 1 [NO] 2

2. Does the inpatient ward have a working oxygen supply (oxygen concentrator or cylinder?) [YES] 1 [NO] 2

3. Does the inpatient ward have a working thermometer? [YES] 1 [NO] 2

4. Are there charts in the hospital on case management of ARI in the hospital (either in the inpatient ward or the OPD?) [YES] 1 [NO] 2

5. How many beds are there in the paediatric ward?

**Get the following information from the hospital medical director**

1. Number of staff assigned to paediatric ward.

- house officers
- registrars
- consultants

- medical officers
- sisters
- nurses
- nurses

**Get the following information from the matron or sister in charge of the paediatric ward.**

1. How many sisters are on day duty?
2. How many sisters are on night duty?
3. How many nurses are on day duty?
4. How many nurses are on night duty?

Record the following for each week of data collection from the hospital records.

- Total number of inpatients of all ages.
- Number of inpatients under five.
- Number of admissions of females under five.
- Number of inpatients under five diagnosed as very severe/severe pneumonia.
- Number of under five female inpatients diagnosed as very severe/severe pneumonia.

## Annex II Consent Form

### Introduction: Introduce yourself

I am \_\_\_\_\_ from \_\_\_\_\_. I am here to conduct a study on pneumonia in children under five. The study is trying to understand the care that is provided to children with pneumonia. I will ask questions on your child's current illness and what you did.

### Request to participate

You are completely free to participate in this study. You do not have to answer any question that you don't wish to, and you can end the interview at any time. All the answers you give will be confidential and will not be known to anyone except the main researcher and researcher assistant. The information you give will not be used in connection with you. Acceptance or refusal to participate will not affect the care you get here at this hospital. However, your answers will help us understand the care that people seek for their children before they bring them to hospitals. I will greatly appreciate your participation.

Do you have any questions?

If you wish to participate, please sign here.

Participant's signature \_\_\_\_\_

Witness's signature \_\_\_\_\_

Date -- / -- / ----

***If the participant cannot write, obtain witnessed consent.***